US010341832B2

(12) **United States Patent**
Tomiyasu et al.

(10) **Patent No.: US 10,341,832 B2**
(45) **Date of Patent: Jul. 2, 2019**

(54) **COOPERATIVE SYSTEM, INFORMATION PROCESSING DEVICE, COOPERATION METHOD, AND COOPERATIVE PROGRAM**

(71) Applicant: **Konica Minolta, Inc.**, Tokyo (JP)

(72) Inventors: **Kazuhiro Tomiyasu**, Toyokawa (JP); **Yoichi Kurumasa**, Toyokawa (JP); **Shoko Haba**, Toyokawa (JP); **Mie Kawabata**, Toyokawa (JP); **Ryosuke Nishimura**, Toyokawa (JP); **Zhenhuan Qu**, Toyokawa (JP)

(73) Assignee: **Konica Minolta, Inc.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 50 days.

(21) Appl. No.: **15/720,228**

(22) Filed: **Sep. 29, 2017**

(65) **Prior Publication Data**

US 2018/0124548 A1 May 3, 2018

(30) **Foreign Application Priority Data**

Nov. 2, 2016 (JP) 2016-215488

(51) **Int. Cl.**

H04W 4/00	(2018.01)
H04W 4/70	(2018.01)
H04J 3/06	(2006.01)
H04L 1/00	(2006.01)
H04L 29/04	(2006.01)
H04W 56/00	(2009.01)
H04L 29/08	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC ***H04W 4/70*** (2018.02); ***H04J 3/0602*** (2013.01); ***H04L 1/0076*** (2013.01); ***H04L 29/04*** (2013.01); ***H04L 67/02*** (2013.01); ***H04L 67/04*** (2013.01); ***H04L 67/08*** (2013.01); ***H04L 67/18*** (2013.01); ***H04W 56/001*** (2013.01)

(58) **Field of Classification Search**

CPC ... H04W 4/005; H04W 56/001; H04J 3/0602; H04L 1/0076; H04L 29/04; H04L 67/04; H04L 67/02; H04L 67/18; G07F 17/3218; G07F 17/34; G06F 3/1454; H04M 1/7253; H04M 1/72544; H04M 2250/16

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

10,217,317 B2 *	2/2019	Nelson	.....	G07F 17/3209
2010/0113148 A1 *	5/2010	Haltovsky	.....	G06F 1/1626 463/30
2013/0130777 A1 *	5/2013	Lemay	.....	G07F 17/3218 463/25

FOREIGN PATENT DOCUMENTS

JP 2008-123476 A 5/2008

* cited by examiner

Primary Examiner — Jung Liu
(74) *Attorney, Agent, or Firm* — Osha Liang LLP

(57) **ABSTRACT**

An information processing device of a cooperative system that further includes a portable device includes: a display that displays an image; a position detector that detects a position on a display surface of the display with which an object has made contact; and a hardware processor that detects the portable device in response to the position detector detecting a position with which an object has made contact, establishes a communication path with the portable device, switches an independent mode not cooperating with the portable device to a cooperation mode cooperating with the portable device when a communication path with the portable device is established and the portable device is detected by the hardware processor, and displays a related image that is related to the portable device on the display in response to the hardware processor no longer detecting the portable device in the cooperation mode.

16 Claims, 12 Drawing Sheets

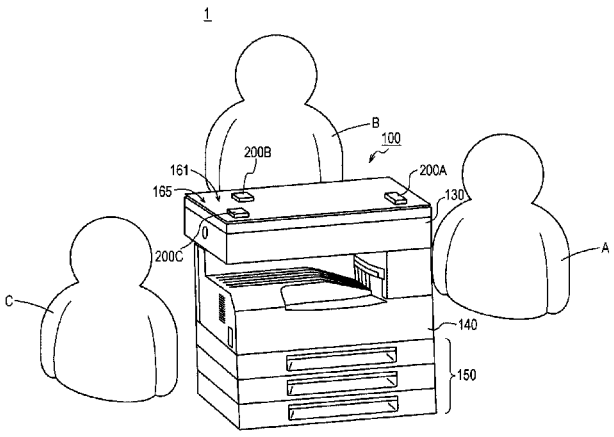


FIG. 1

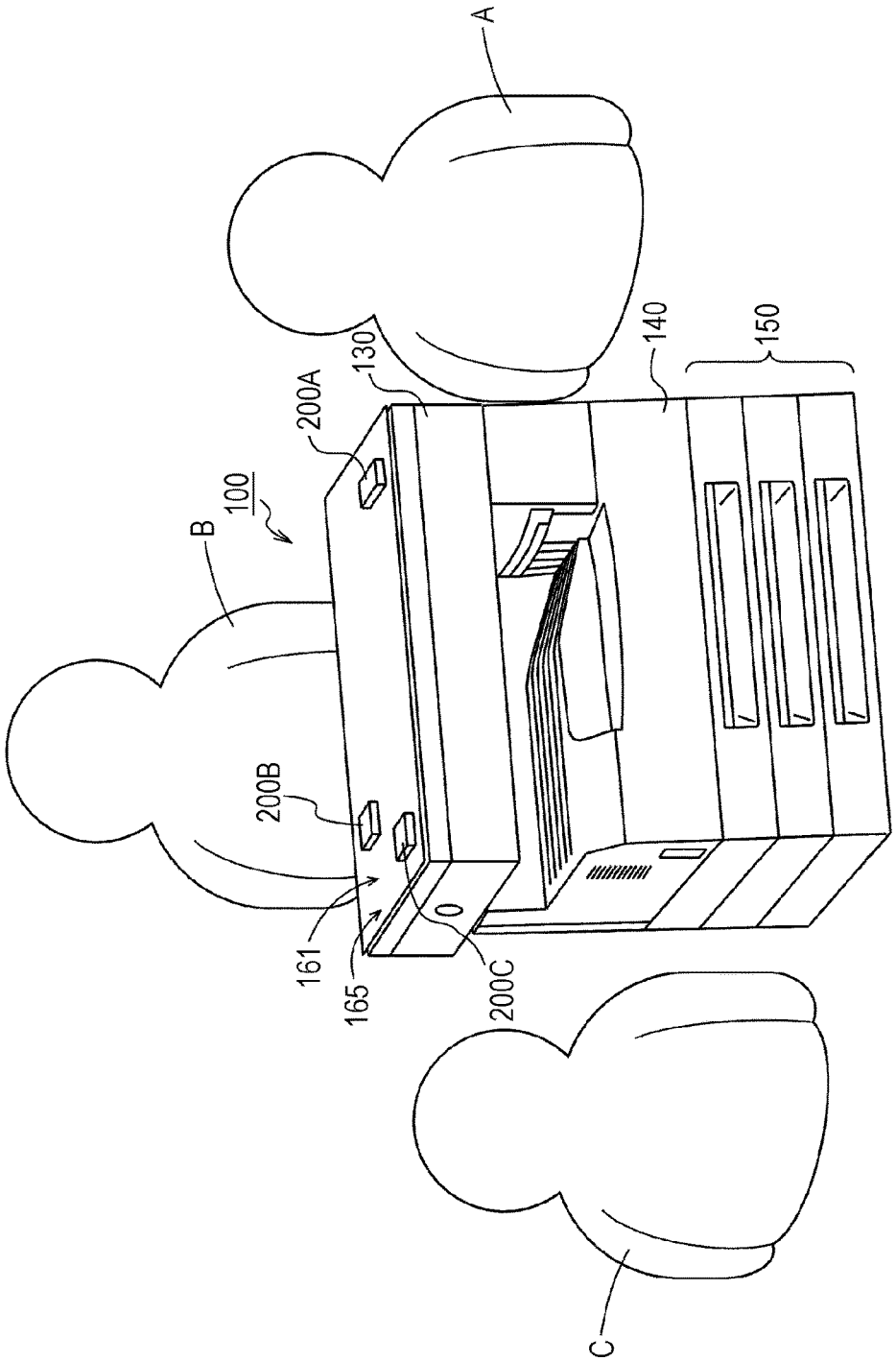


FIG. 2

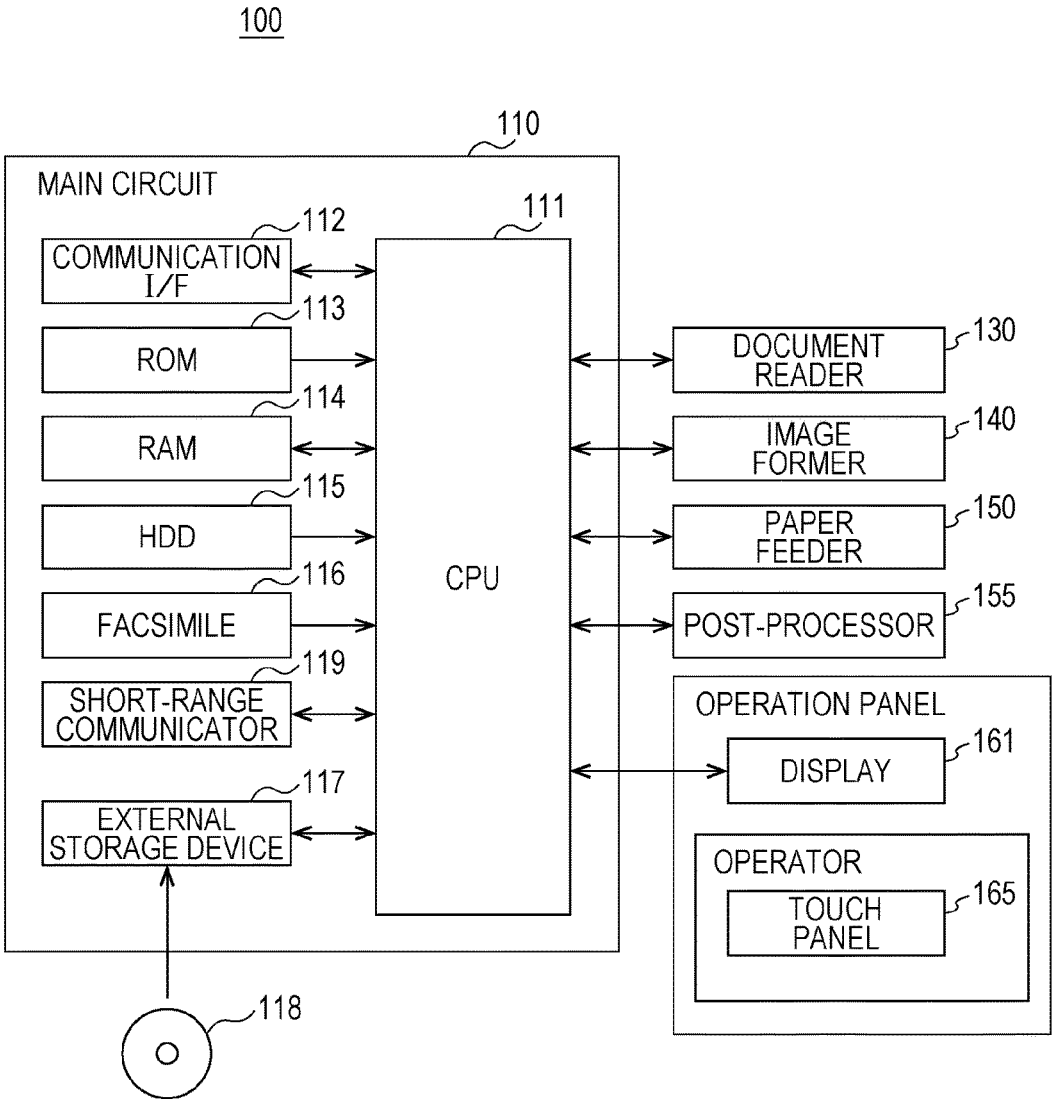

100
110
MAIN CIRCUIT
112
COMMUNICATION I/F
111
113
ROM
114
RAM
115
HDD
116
FACSIMILE
119
SHORT-RANGE COMMUNICATOR
117
EXTERNAL STORAGE DEVICE
CPU
118
DOCUMENT READER
130
IMAGE FORMER
140
PAPER FEEDER
150
POST-PROCESSOR
155
OPERATION PANEL
DISPLAY
161
OPERATOR
TOUCH PANEL
165

FIG. 3

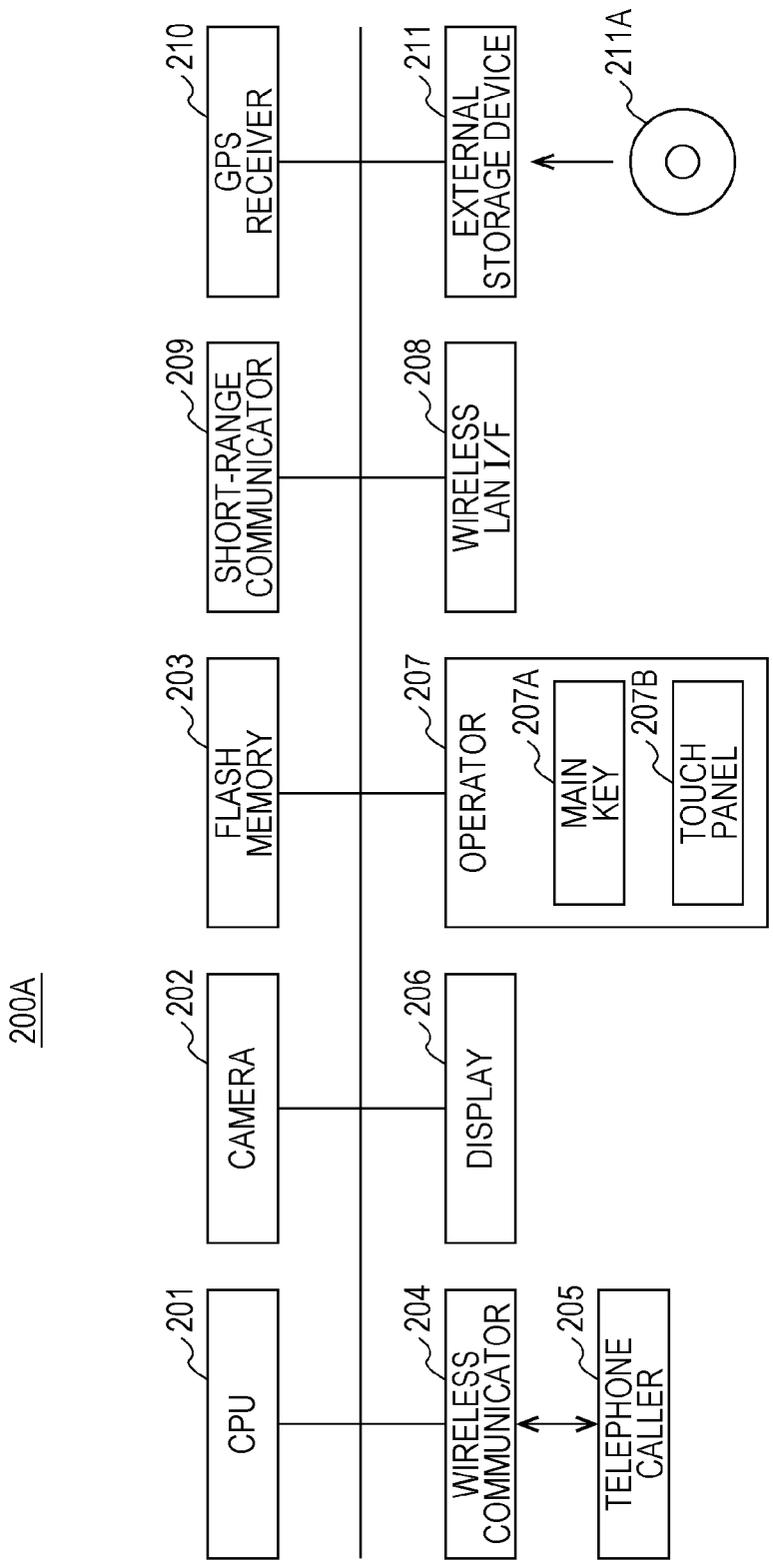

200A
201
CPU
202
CAMERA
203
FLASH MEMORY
204
WIRELESS COMMUNICATOR
205
TELEPHONE CALLER
206
DISPLAY
207
OPERATOR
207A
MAIN KEY
207B
TOUCH PANEL
208
WIRELESS LAN I/F
209
SHORT-RANGE COMMUNICATOR
210
GPS RECEIVER
211
EXTERNAL STORAGE DEVICE
211A

FIG. 4

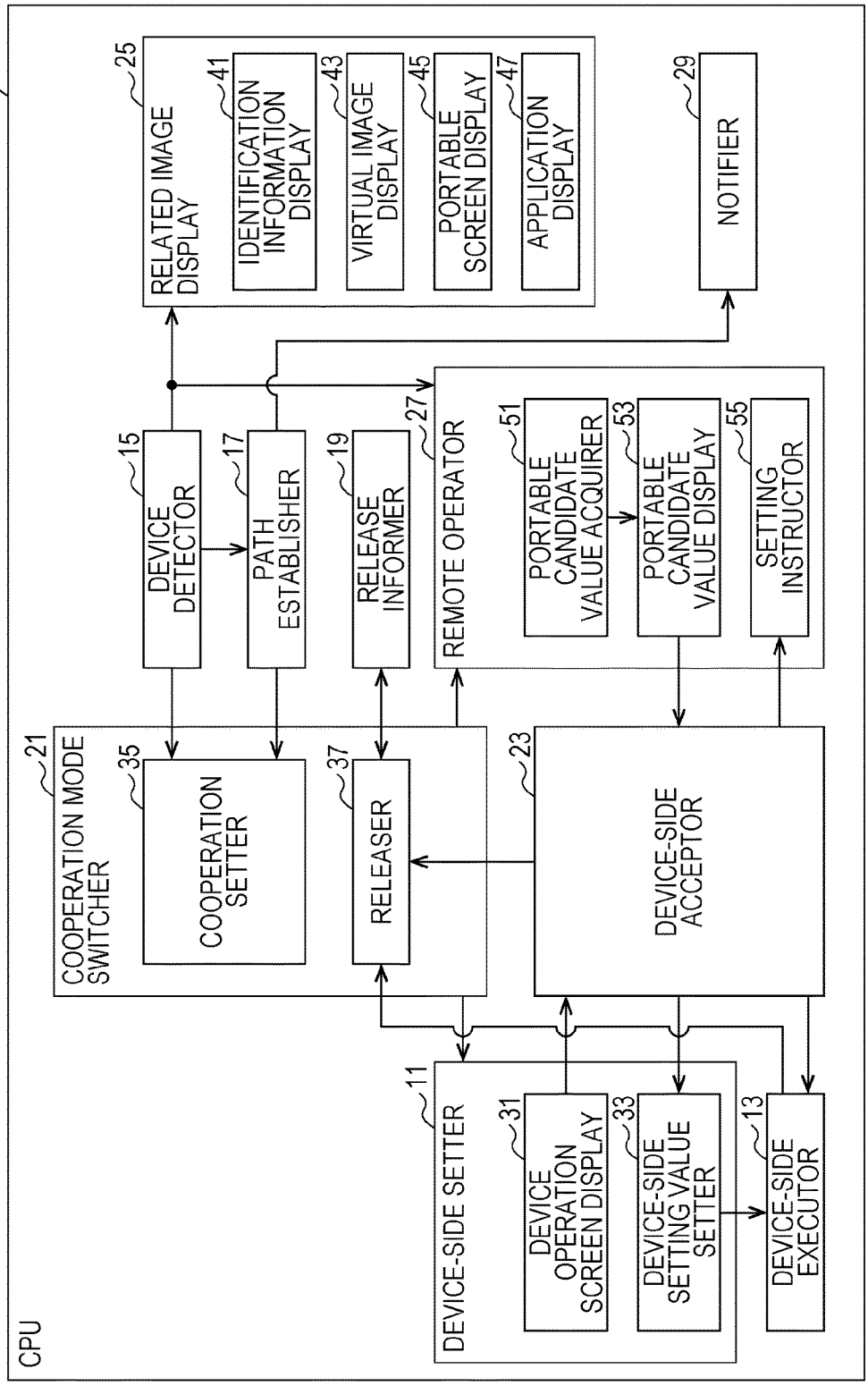

111
CPU
25
RELATED IMAGE DISPLAY
41
IDENTIFICATION INFORMATION DISPLAY
43
VIRTUAL IMAGE DISPLAY
45
PORTABLE SCREEN DISPLAY
47
APPLICATION DISPLAY
29
NOTIFIER
15
DEVICE DETECTOR
17
PATH ESTABLISHER
19
RELEASE INFORMER
27
REMOTE OPERATOR
51
PORTABLE CANDIDATE VALUE ACQUIRER
53
PORTABLE CANDIDATE VALUE DISPLAY
55
SETTING INSTRUCTOR
21
COOPERATION MODE SWITCHER
35
COOPERATION SETTER
37
RELEASER
23
DEVICE-SIDE ACCEPTOR
11
DEVICE-SIDE SETTER
31
DEVICE OPERATION SCREEN DISPLAY
33
DEVICE-SIDE SETTING VALUE SETTER
13
DEVICE-SIDE EXECUTOR

FIG. 5

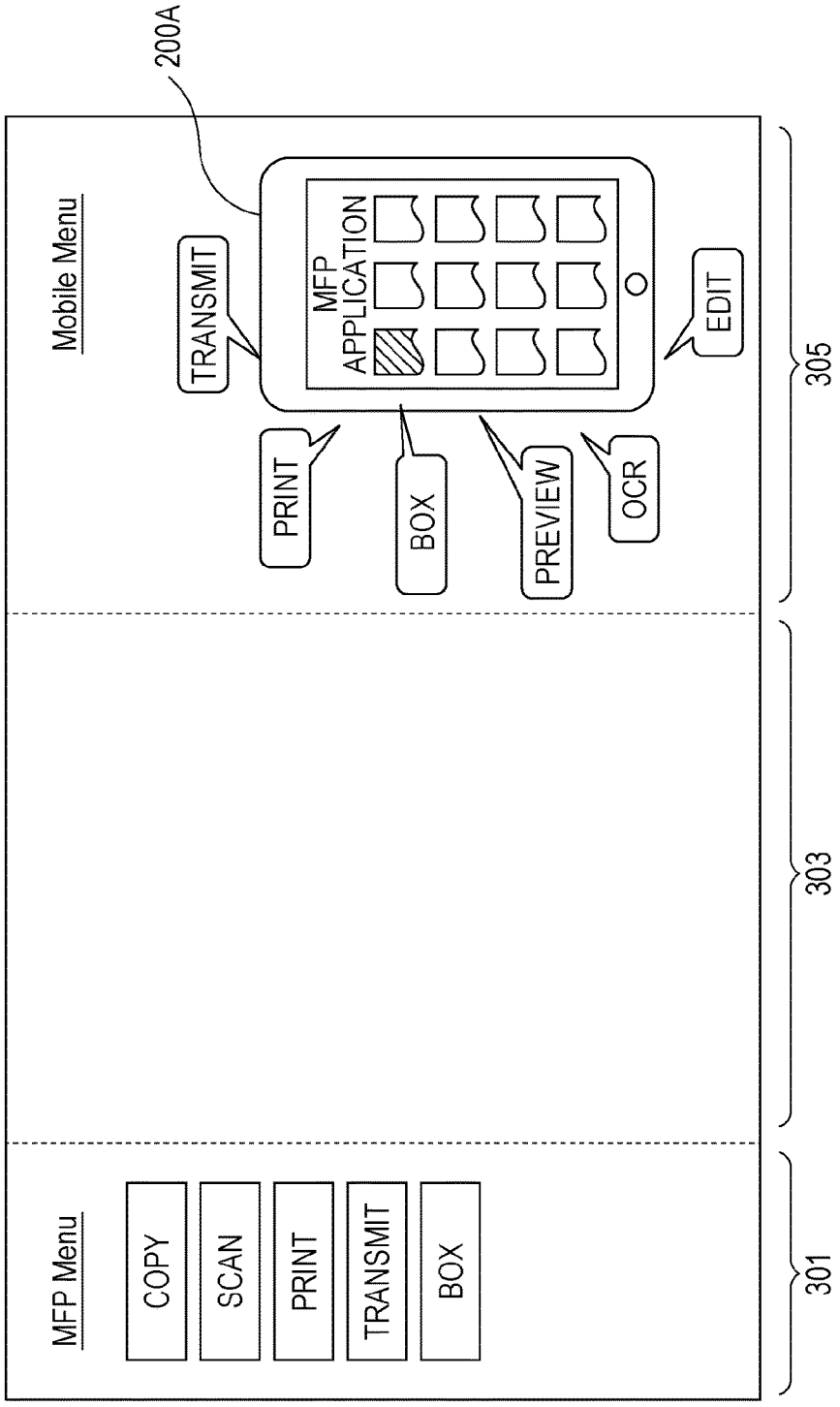

300
MFP Menu
COPY
SCAN
PRINT
TRANSMIT
BOX
301
303
Mobile Menu
200A
TRANSMIT
MFP APPLICATION
EDIT
PRINT
BOX
PREVIEW
OCR
305

FIG. 6

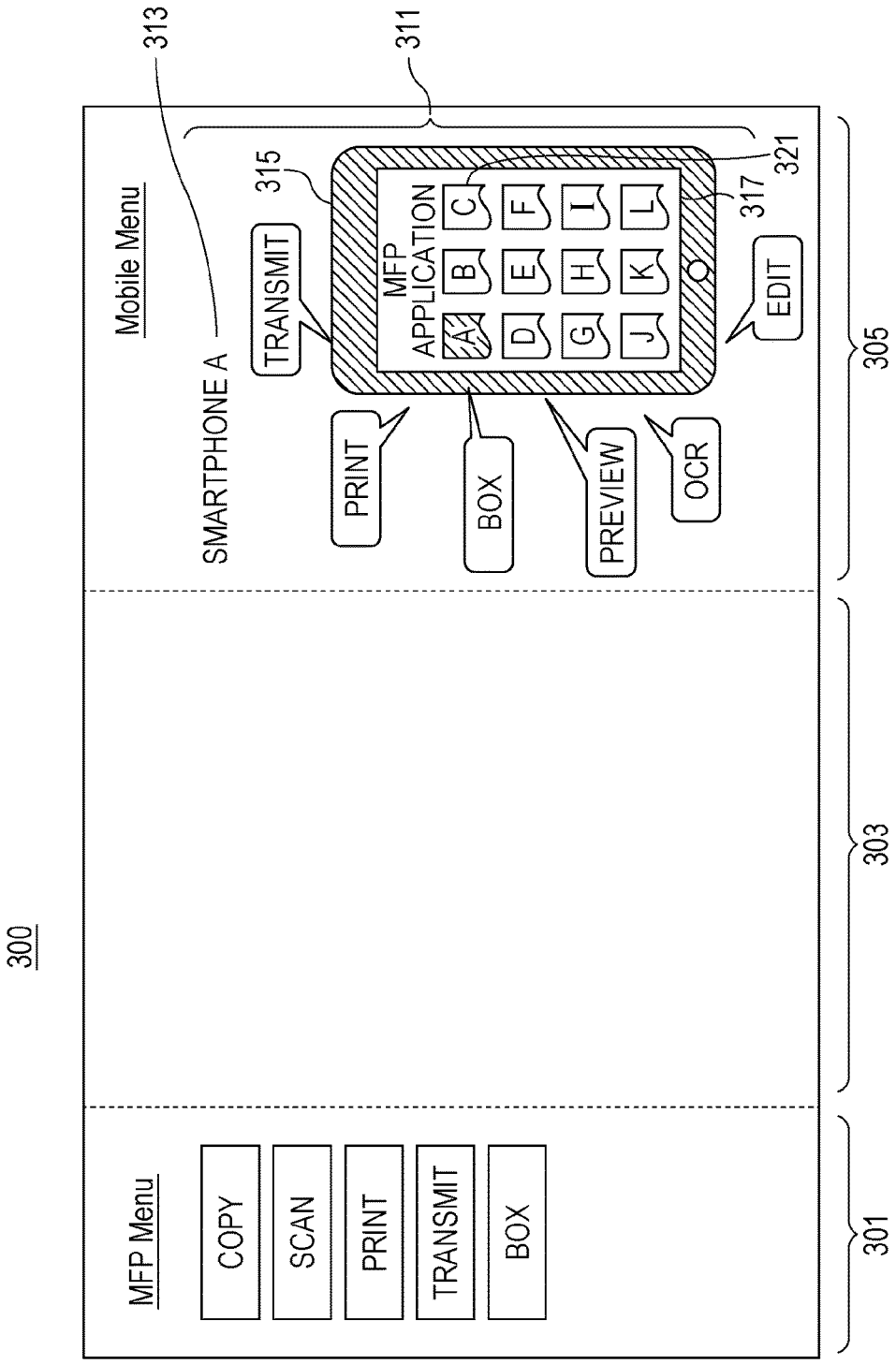

300
313
311
315
321
317
Mobile Menu
SMARTPHONE A
TRANSMIT
MFP APPLICATION
A
B
C
D
E
F
G
H
I
J
K
L
EDIT
PRINT
BOX
PREVIEW
OCR
305
303
301
MFP Menu
COPY
SCAN
PRINT
TRANSMIT
BOX

FIG. 7

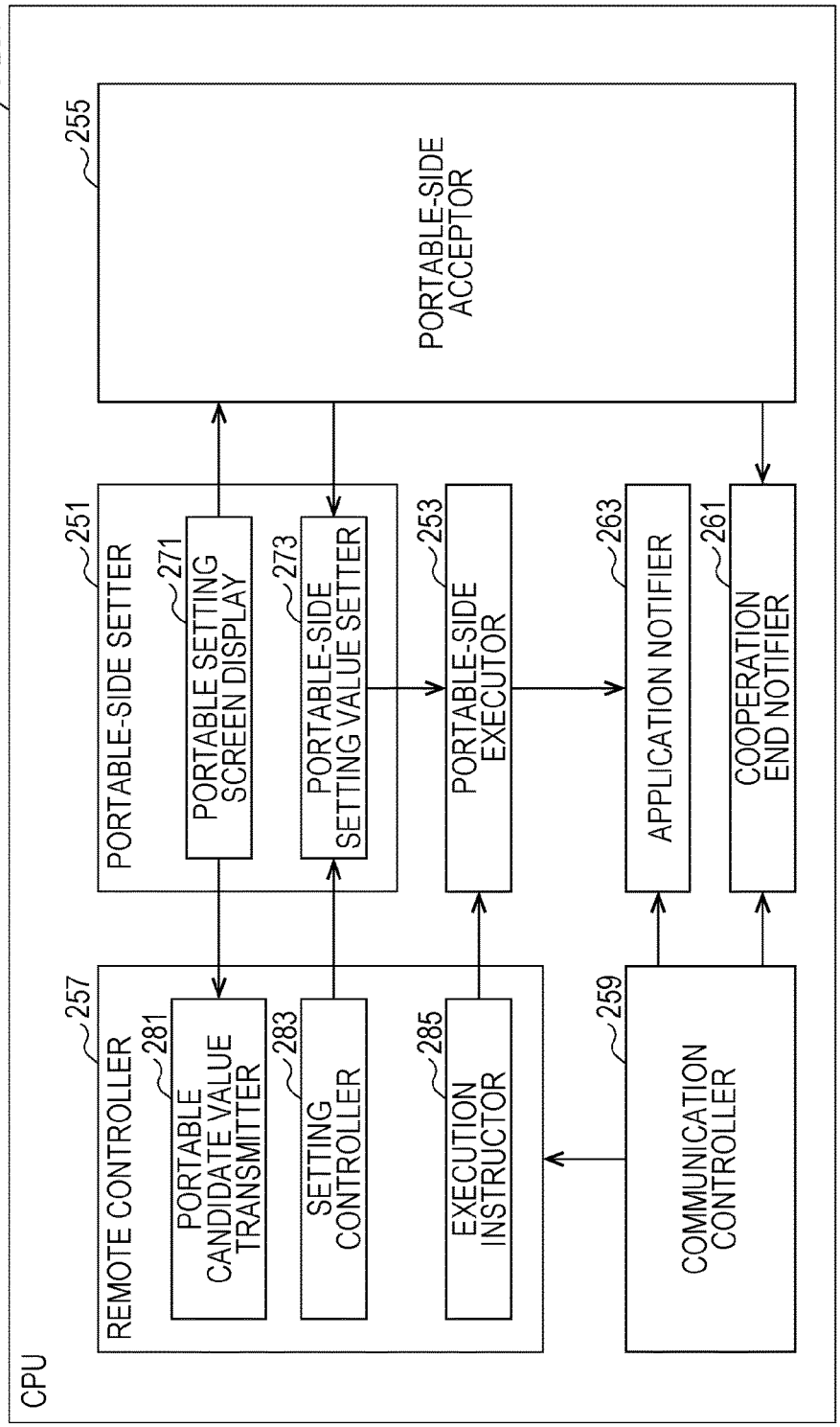

201
CPU
255
PORTABLE-SIDE ACCEPTOR
251
PORTABLE-SIDE SETTER
271
PORTABLE SETTING SCREEN DISPLAY
273
PORTABLE-SIDE SETTING VALUE SETTER
253
PORTABLE-SIDE EXECUTOR
263
APPLICATION NOTIFIER
261
COOPERATION END NOTIFIER
257
REMOTE CONTROLLER
281
PORTABLE CANDIDATE VALUE TRANSMITTER
283
SETTING CONTROLLER
285
EXECUTION INSTRUCTOR
259
COMMUNICATION CONTROLLER

FIG. 8

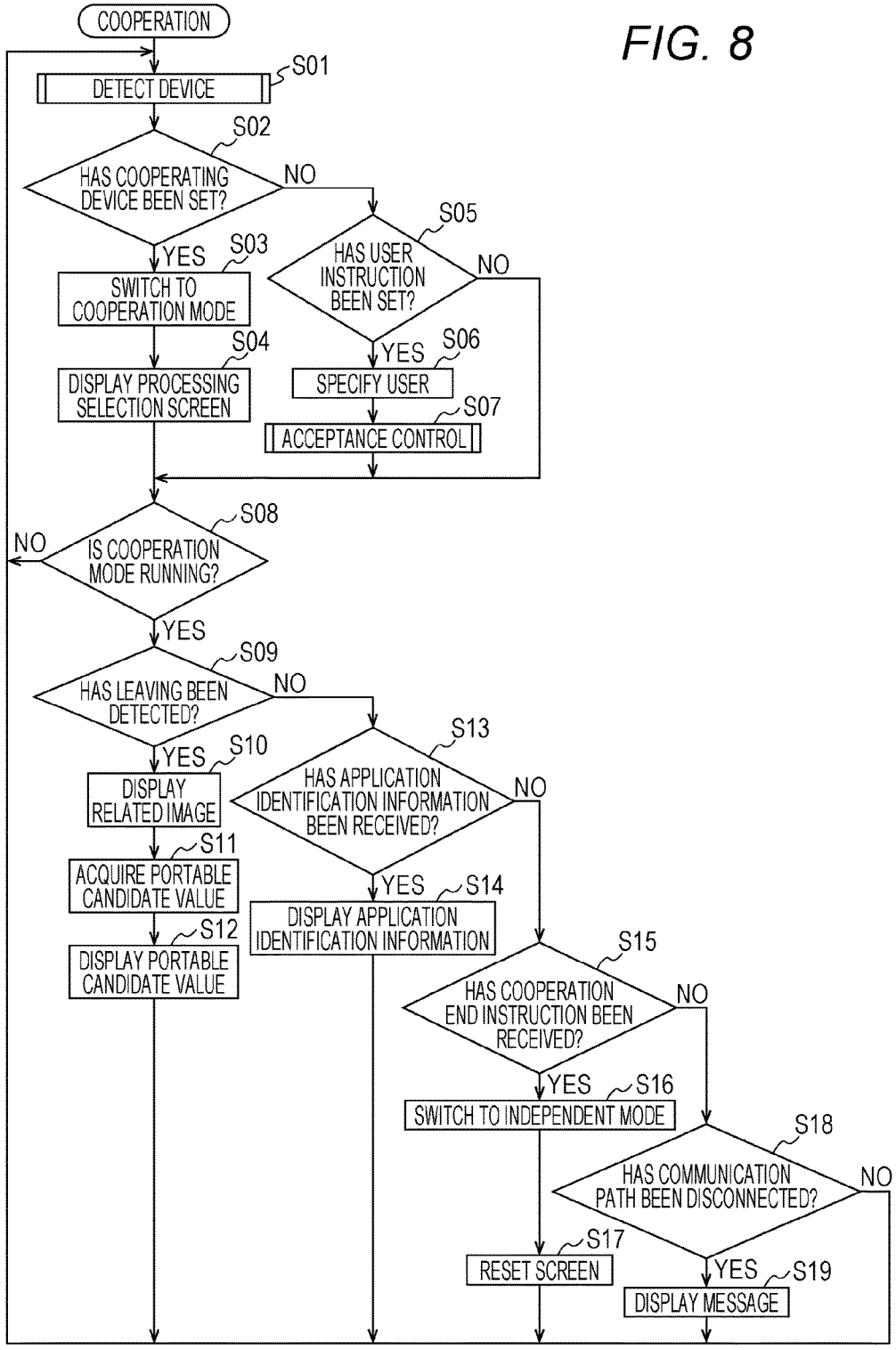

COOPERATION
DETECT DEVICE
S01
HAS COOPERATING DEVICE BEEN SET?
S02
NO
YES
SWITCH TO COOPERATION MODE
S03
DISPLAY PROCESSING SELECTION SCREEN
S04
HAS USER INSTRUCTION BEEN SET?
S05
NO
YES
SPECIFY USER
S06
ACCEPTANCE CONTROL
S07
IS COOPERATION MODE RUNNING?
S08
NO
YES
HAS LEAVING BEEN DETECTED?
S09
NO
YES
DISPLAY RELATED IMAGE
S10
ACQUIRE PORTABLE CANDIDATE VALUE
S11
DISPLAY PORTABLE CANDIDATE VALUE
S12
HAS APPLICATION IDENTIFICATION INFORMATION BEEN RECEIVED?
S13
NO
YES
DISPLAY APPLICATION IDENTIFICATION INFORMATION
S14
HAS COOPERATION END INSTRUCTION BEEN RECEIVED?
S15
NO
YES
SWITCH TO INDEPENDENT MODE
S16
RESET SCREEN
S17
HAS COMMUNICATION PATH BEEN DISCONNECTED?
S18
NO
YES
DISPLAY MESSAGE
S19

FIG. 9

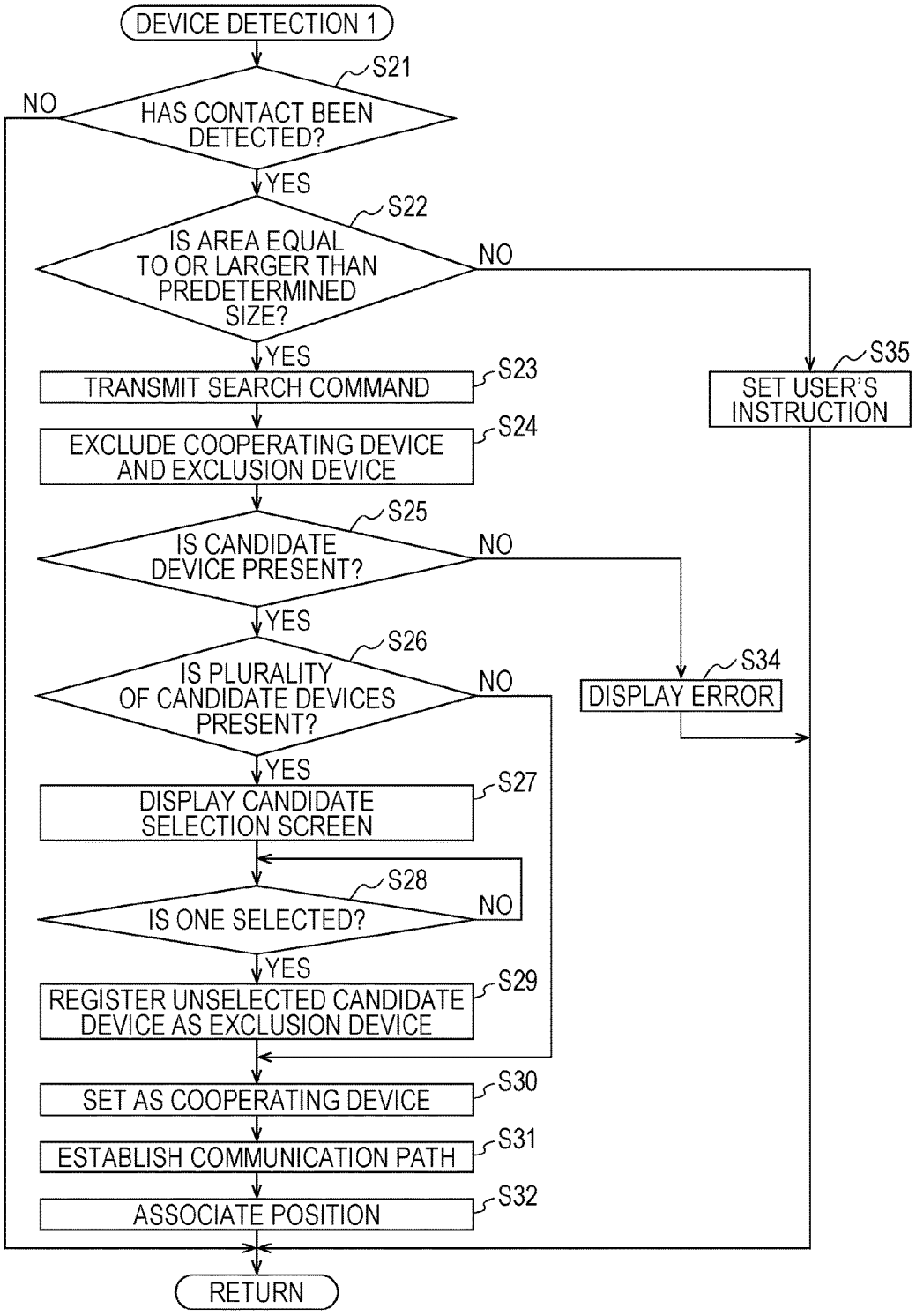

DEVICE DETECTION 1
S21
HAS CONTACT BEEN DETECTED?
NO
YES
S22
IS AREA EQUAL TO OR LARGER THAN PREDETERMINED SIZE?
NO
YES
S35
SET USER'S INSTRUCTION
S23
TRANSMIT SEARCH COMMAND
S24
EXCLUDE COOPERATING DEVICE AND EXCLUSION DEVICE
S25
IS CANDIDATE DEVICE PRESENT?
NO
YES
S34
DISPLAY ERROR
S26
IS PLURALITY OF CANDIDATE DEVICES PRESENT?
NO
YES
S27
DISPLAY CANDIDATE SELECTION SCREEN
S28
IS ONE SELECTED?
NO
YES
S29
REGISTER UNSELECTED CANDIDATE DEVICE AS EXCLUSION DEVICE
S30
SET AS COOPERATING DEVICE
S31
ESTABLISH COMMUNICATION PATH
S32
ASSOCIATE POSITION
RETURN

FIG. 10

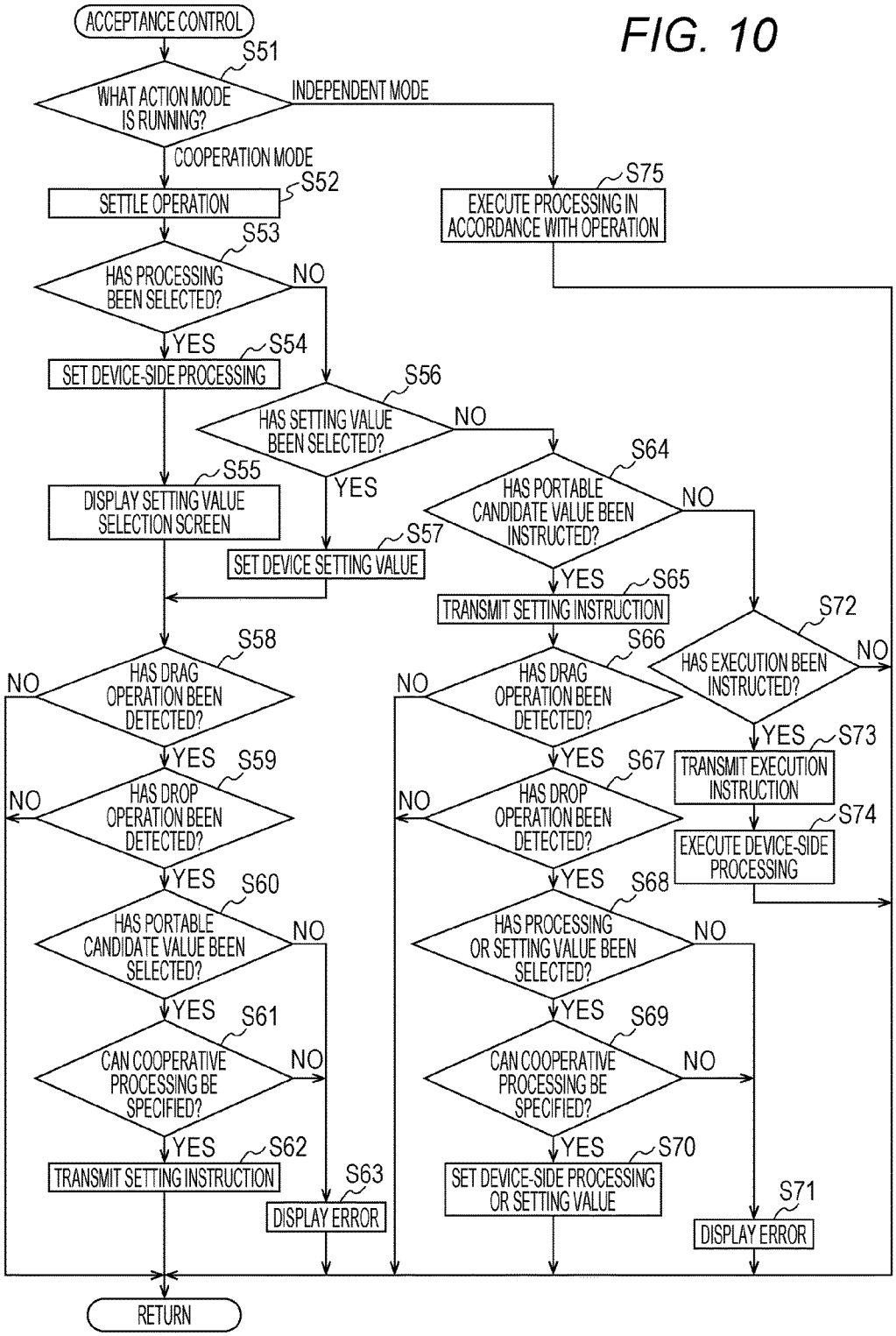

ACCEPTANCE CONTROL
S51
WHAT ACTION MODE IS RUNNING?
INDEPENDENT MODE
COOPERATION MODE
S52
SETTLE OPERATION
S53
HAS PROCESSING BEEN SELECTED?
NO
YES
S54
SET DEVICE-SIDE PROCESSING
S55
DISPLAY SETTING VALUE SELECTION SCREEN
S56
HAS SETTING VALUE BEEN SELECTED?
NO
YES
S57
SET DEVICE SETTING VALUE
S58
HAS DRAG OPERATION BEEN DETECTED?
NO
YES
S59
HAS DROP OPERATION BEEN DETECTED?
NO
YES
S60
HAS PORTABLE CANDIDATE VALUE BEEN SELECTED?
NO
YES
S61
CAN COOPERATIVE PROCESSING BE SPECIFIED?
NO
YES
S62
TRANSMIT SETTING INSTRUCTION
S63
DISPLAY ERROR
S75
EXECUTE PROCESSING IN ACCORDANCE WITH OPERATION
S64
HAS PORTABLE CANDIDATE VALUE BEEN INSTRUCTED?
NO
YES
S65
TRANSMIT SETTING INSTRUCTION
S66
HAS DRAG OPERATION BEEN DETECTED?
NO
YES
S67
HAS DROP OPERATION BEEN DETECTED?
NO
YES
S68
HAS PROCESSING OR SETTING VALUE BEEN SELECTED?
NO
YES
S69
CAN COOPERATIVE PROCESSING BE SPECIFIED?
NO
YES
S70
SET DEVICE-SIDE PROCESSING OR SETTING VALUE
S71
DISPLAY ERROR
S72
HAS EXECUTION BEEN INSTRUCTED?
NO
YES
S73
TRANSMIT EXECUTION INSTRUCTION
S74
EXECUTE DEVICE-SIDE PROCESSING
RETURN

FIG. 11

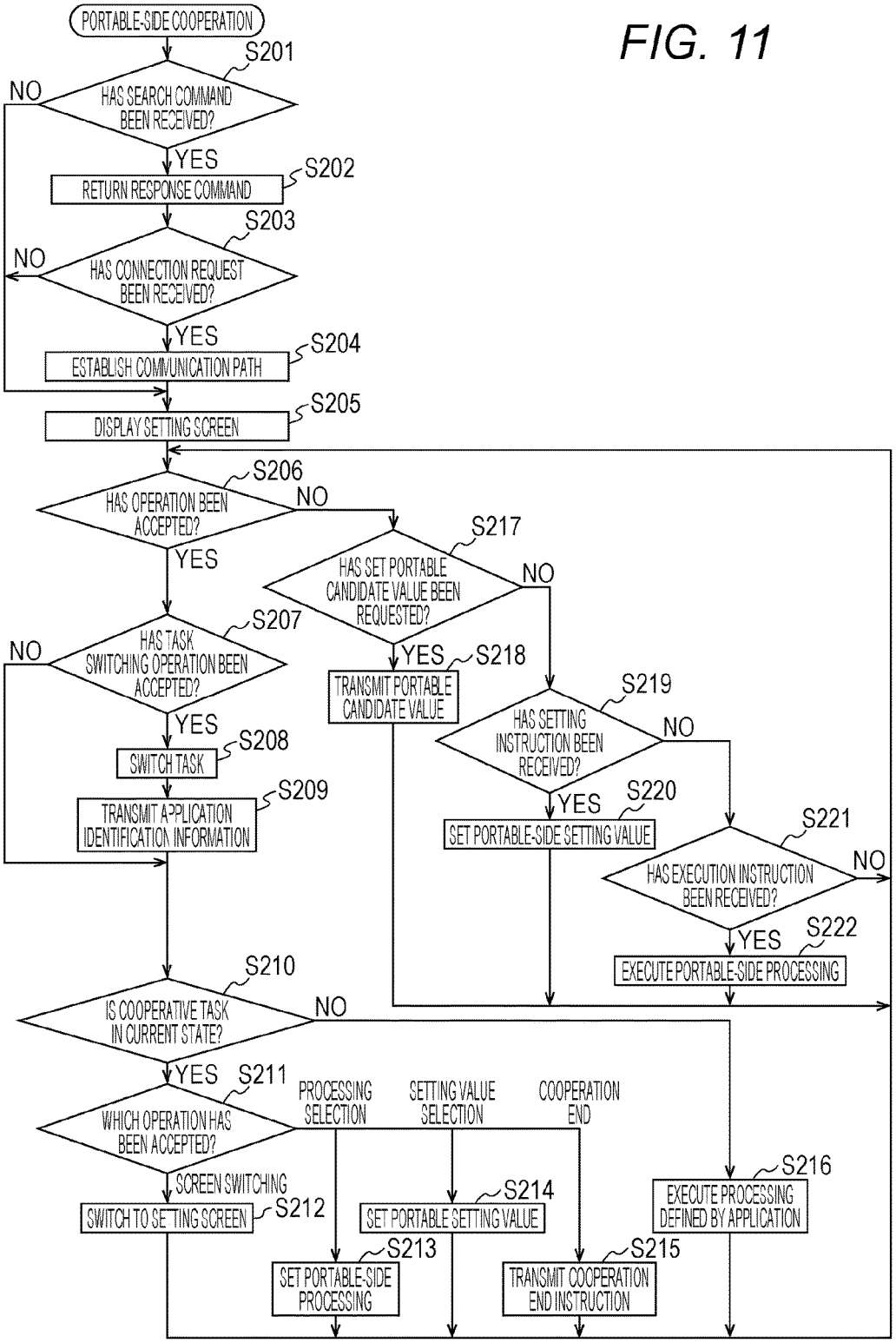
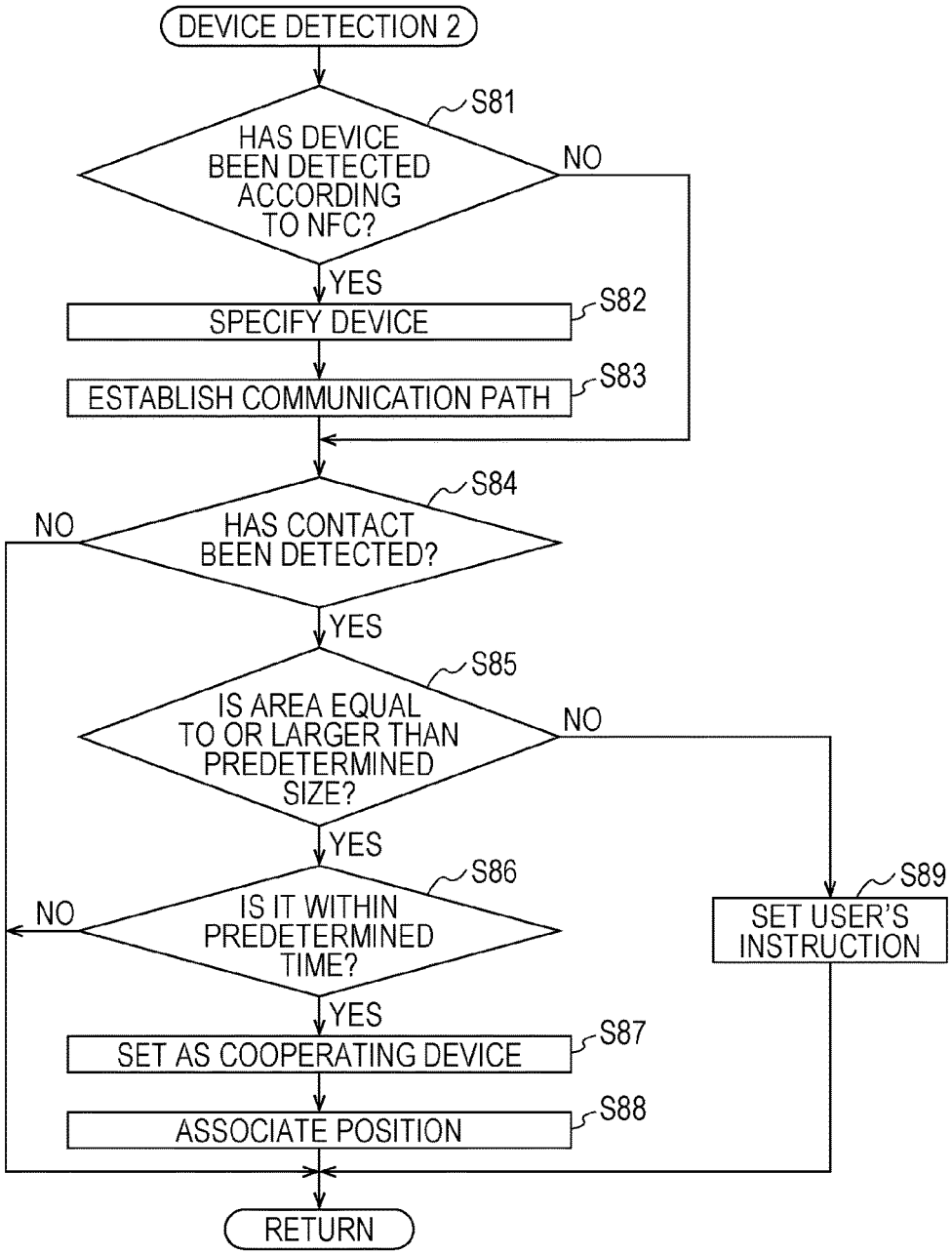

PORTABLE-SIDE COOPERATION
S201
HAS SEARCH COMMAND BEEN RECEIVED?
NO
YES
S202
RETURN RESPONSE COMMAND
S203
HAS CONNECTION REQUEST BEEN RECEIVED?
NO
YES
S204
ESTABLISH COMMUNICATION PATH
S205
DISPLAY SETTING SCREEN
S206
HAS OPERATION BEEN ACCEPTED?
NO
YES
S207
HAS TASK SWITCHING OPERATION BEEN ACCEPTED?
NO
YES
S208
SWITCH TASK
S209
TRANSMIT APPLICATION IDENTIFICATION INFORMATION
S210
IS COOPERATIVE TASK IN CURRENT STATE?
NO
YES
S211
WHICH OPERATION HAS BEEN ACCEPTED?
PROCESSING SELECTION
SETTING VALUE SELECTION
COOPERATION END
SCREEN SWITCHING
S212
SWITCH TO SETTING SCREEN
S213
SET PORTABLE-SIDE PROCESSING
S214
SET PORTABLE SETTING VALUE
S215
TRANSMIT COOPERATION END INSTRUCTION
S216
EXECUTE PROCESSING DEFINED BY APPLICATION
S217
HAS SET PORTABLE CANDIDATE VALUE BEEN REQUESTED?
NO
YES
S218
TRANSMIT PORTABLE CANDIDATE VALUE
S219
HAS SETTING INSTRUCTION BEEN RECEIVED?
NO
YES
S220
SET PORTABLE-SIDE SETTING VALUE
S221
HAS EXECUTION INSTRUCTION BEEN RECEIVED?
NO
YES
S222
EXECUTE PORTABLE-SIDE PROCESSING

FIG. 12


DEVICE DETECTION 2
S81
HAS DEVICE BEEN DETECTED ACCORDING TO NFC?
NO
YES
S82
SPECIFY DEVICE
S83
ESTABLISH COMMUNICATION PATH
S84
HAS CONTACT BEEN DETECTED?
NO
YES
S85
IS AREA EQUAL TO OR LARGER THAN PREDETERMINED SIZE?
NO
YES
S86
IS IT WITHIN PREDETERMINED TIME?
NO
YES
S87
SET AS COOPERATING DEVICE
S88
ASSOCIATE POSITION
S89
SET USER'S INSTRUCTION
RETURN

COOPERATIVE SYSTEM, INFORMATION PROCESSING DEVICE, COOPERATION METHOD, AND COOPERATIVE PROGRAM

Japanese Patent Application No. 2016-215488 filed on Nov. 2, 2016, including description, claims, drawings, and abstract the entire disclosure is incorporated herein by reference in its entirety.

TECHNOLOGICAL FIELD

The present invention relates to a cooperative system, an information processing device, a cooperation method, and a cooperative program, and more particularly, to a cooperative system including a portable device carried by a user and an information processing device that executes cooperative processing in cooperation with this portable device, this information processing device, a cooperation method and a cooperative program executed by this information processing device.

BACKGROUND

In recent years, a technology of remotely operating an image processing device such as a multi function peripheral (MFP) with a portable device such as a smartphone or a personal digital assistant (PDA) carried by a user has been known.

For example, JP 2008-123476 A describes an image processing device that determines whether an operation of touching a display surface of a liquid crystal panel is caused by a portable information terminal placed on the display surface or a user's instruction with a finger and, when it is determined that the operation is caused by the portable information terminal, establishes a communication path with the portable information terminal only while the portable information terminal is placed on the display surface to display a processing menu screen for the portable information terminal.

However, there is a case where other processing is executed on the portable information terminal while the portable information terminal is placed on the liquid crystal panel because, for example, this portable information terminal receives an incoming call from the outside. In this case, settings of the portable information terminal are interrupted and cannot be continued. In addition, the user cannot judge whether settings of the portable information terminal are continuing or have been interrupted.

SUMMARY

One or more embodiments of the present invention provide a cooperative system capable of notifying a state of cooperation maintained between two devices while two devices are not in contact.

One or more embodiments of the present invention provide an information processing device capable of notifying a state of cooperation maintained with a portable device while the portable device is not in contact.

One or more embodiments of the present invention provide a cooperation method capable of notifying a state of cooperation maintained with a portable device while the portable device is not in contact.

One or more embodiments of the present invention provide a cooperative program capable of notifying a state of cooperation maintained with a portable device while the portable device is not in contact.

According to one or more embodiments of the present invention, a cooperative system comprises an information processing device and a portable device carried by a user, wherein the information processing device includes: a display that displays an image; a position detector that detects a position on a display surface of the display with which an object has made contact; and a hardware processor that detects the portable device in response to the position detector detecting a position with which an object has made contact, establishes a communication path with the portable device, switches an independent mode not cooperating with the portable device to a cooperation mode cooperating with the portable device when a communication path with the portable device is established and the portable device is detected by the hardware processor, and displays a related image relating to the portable device on the display in response to the hardware processor no longer detecting the portable device in the cooperation mode.

BRIEF DESCRIPTION OF THE DRAWING

The advantages and features provided by one or more embodiments of the invention will become more fully understood from the detailed description given hereinbelow and the appended drawings which are given by way of illustration only, and thus are not intended as a definition of the limits of the present invention:

FIG. **1** is a diagram illustrating an example of an overall outline of a cooperative system according to one or more embodiments of the present invention;

FIG. **2** is a block diagram illustrating an example of a hardware configuration of an MFP according to one or more embodiments;

FIG. **3** is a block diagram illustrating an outline of a hardware configuration of a smartphone according to one or more embodiments;

FIG. **4** is a block diagram illustrating an example of functions of a CPU included in the MFP according to one or more embodiments;

FIG. **5** is a diagram illustrating an example of an operation screen according to one or more embodiments;

FIG. **6** is a diagram illustrating an example of the operation screen in a state in which a smartphone has been detached according to one or more embodiments;

FIG. **7** is a diagram illustrating an example of functions provided in a CPU included in a smartphone according to one or more embodiments;

FIG. **8** is a flowchart illustrating an example of a flow of cooperative processing according to one or more embodiments;

FIG. **9** is a flowchart illustrating an example of a flow of device detection processing according to one or more embodiments;

FIG. **10** is a flowchart illustrating an example of a flow of acceptance control processing according to one or more embodiments;

FIG. **11** is a flowchart illustrating an example of a flow of portable-side cooperative processing according to one or more embodiments; and

FIG. **12** is a flowchart illustrating an example of a flow of device detection processing according to a first modification according to one or more embodiments.

DETAILED DESCRIPTION

Hereinafter, one or more embodiments of the present invention will be described with reference to the drawings.

However, the scope of the invention is not limited to the disclosed embodiments. In the following description, the same members are denoted by the same reference numerals. The names and functions thereof are also the same. Therefore, detailed description thereof will not be repeated.

FIG. **1** is a diagram illustrating an example of an overall outline of a cooperative system according to one or more embodiments of the present invention. Referring to FIG. **1**, the cooperative system **1** includes a multi function peripheral (MFP) **100** and smartphones **200**A, **200**B, and **200**C. The example here depicts a case where three users A, B, and C carry the smartphones **200**A, **200**B, and **200**C, respectively, and operate the MFP **100** at the same time.

Note that, although description will be made here using as an example a case where the three users A, B, and C operate the MFP **100** at the same time, the number of users is not limited thereto and it is only required that one or more users operate the MFP **100**.

In one or more embodiments, the MFP **100** is an example of an information processing device and includes a display **161**, a touch panel **165**, a document reader **130** that reads a document, an image former **140** that forms an image on a sheet or the like based on data, and a paper feeder **150** that supplies a sheet to the image former **140**. The display **161** is a display device such as a liquid crystal display (LCD) device or an organic electro-luminescence display (ELD). The display **161** is provided on an upper surface of a main body of the MFP **100**. The touch panel **165** is provided so as to be superimposed on an upper surface or a lower surface of the display **161** and detects a position on a display surface of the display **161** with which an object has made contact. The touch panel **165** is a multi-touch compatible touch panel. Therefore, when an object makes contact with a plurality of places on the display surface of the display **161** at a time, the touch panel **165** can detect a plurality of positions with which the object has made contact. The object here includes the smartphones **200**A, **200**B, **200**C in addition to a user's finger.

Note that a single touch panel **165** may be used, or a plurality of touch panels **165** may be combined. In a case where the touch panel **165** is constituted by a combination of a plurality of touch panels, for example, the display surface of the display **161** is simply divided into a plurality of regions such that the plurality of touch panels is inked with the plurality of respective regions. For example, a resistance film technique, a surface acoustic wave technique, an infrared technique, an electromagnetic induction technique, and a capacitance technique can be used for the touch panel **165** and the technique therefor is not limited.

Each of the three users A, B, and C is located around the MFP **100**. The MFP **100** can be used for a meeting in which the users A, B, and C participate. Since each of the users A, B, and C is located around the MFP **100**, the users A, B, and C can visually recognize the entire display surface of the display **161**. Therefore, if data prepared for the meeting is, for example, stored to the MFP **100** in advance, the same data can be shown to the users A, B, and C at the same time by displaying this data on the display **161**. In addition, the touch panel **165** of the MFP **100** is used as an input device for the users A, B, and C to operate the MFP **100**. For example, when an application program for editing a document is installed in the MFP **100**, the MFP **100** may be used to create a document using the touch panel **165** as a keyboard.

The smartphones **200**A, **200**B, and **200**C are examples of a portable device and are carried and used by the users A, B, and C, respectively. The users A, B, and C place the smartphones **200**A, **200**B, and **200**C on the display surface of the display **161**. Therefore, each of the smartphones **200**A, **200**B, and **200**C is arranged on the display surface of the display **161** in the vicinity of a side in a direction in which each of the users A, B, and C is located. In this case, since the touch panel **165** detects each of the smartphones **200**A, **200**B, and **200**C, the MFP **100** can detect the positions of the respective smartphones **200**A, **200**B, and **200**C.

Each of the MFP **100** and the smartphones **200**A, **200**B, and **200**C has a short-range wireless communication function and can communicate with each other on a one-to-one basis when the other device is located within a predetermined range. In addition, each of the MFP **100** and the smartphones **200**A, **200**B, and **200**C has a wireless LAN function and can communicate with a wireless base station connected to a network. The wireless base station is a relay device for the network and communicates with the MFP **100** and the smartphones **200**A, **200**B, and **200**C to connect each of the MFP **100** and the smartphones **200**A, **200**B, and **200**C to the network. Therefore, the MFP **100** and the smartphones **200**A, **200**B, and **200**C can communicate with each other via the network by individually communicating with the wireless base station. The network is, for example, a local area network (LAN) and the connection form may be wired or wireless. The network may also be connected to the Internet. In this case, each of the MFP **100** and the smartphones **200**A, **200**B, and **200**C can communicate with a computer connected to the Internet. In addition, the network is not limited to the LAN but may be a network using public switched telephone networks, or the like. Additionally, the network may be a wide area network (WAN) such as the Internet.

In the cooperative system **1** according to one or more embodiments, any of the smartphones **200**A, **200**B, and **200**C, and the MFP **100** can cooperatively execute cooperative processing. For example, the smartphone **200**A and the MFP **100** communicate using a short-range communication function or a wireless LAN function to execute the cooperative processing in cooperation with each other. A series of multiple items of processing are defined in the cooperative processing. The series of multiple items of processing defined by the cooperative processing includes device-side processing executed by the MFP **100** and portable-side processing executed by the smartphone **200**A. For example, in a case where the MFP **100** and the smartphone **200**A execute cooperative processing whose portable-side processing is processing of selecting data and whose device-side processing is processing of forming an image, this cooperative processing is processing in which the MFP **100** forms an image of data stored in the smartphone **200**A, which has been selected by the user A operating the smartphone **200**A, on a sheet in accordance with an image formation condition set by the user A operating the MFP **100**. In addition, in a case where the device-side processing is processing of selecting data and the portable-side processing is processing of transmitting the data, the cooperative processing executed by the MFP **100** and the smartphone **200**A is processing in which the smartphone **200**A transmits data stored in the MFP **100**, which has been selected by the user A operating the MFP **100**, in accordance with a transmission condition set by the user A operating the smartphone **200**A. The transmission condition is, for example, settled by the user selecting a destination and a transmission method according to an address book stored in the smartphone **200**A.

Note that the smartphones **200**A, **200**B, and **200**C will be described as an example of the portable device carried by the

user, but personal digital assistants (PDAs) or the like may be used as long as the device can be carried by the user.

FIG. **2** is a block diagram illustrating an example of a hardware configuration of the MFP according to one or more embodiments. Referring to FIG. **2**, the MFP **100** includes a main circuit **110**, the document reader **130**, the image former **140**, the paper feeder **150**, the display **161**, and the touch panel **165**.

The main circuit **110** includes a CPU **111**, a communication interface (I/F) **112**, a ROM **113**, a RAM **114**, a hard disk drive (HDD) **115** as a mass storage device, a facsimile **116**, an external storage device **117** to which a compact disc read only memory (CD-ROM) **118** is attached, and a short-range communicator **119**. The CPU **111** is connected to the document reader **130**, the image former **140**, the paper feeder **150**, the display **161**, and the touch panel **165** and controls the entirety of the MFP **100**.

The ROM **113** stores a program executed by the CPU **111** or data necessary for executing the program. The RAM **114** is used as a work area when the CPU **111** executes a program. In addition, the RAM **114** temporarily stores read data (image data) successively sent from the document reader **130**.

The communication I/F **112** is an interface for connecting the MFP **100** to the network. The CPU **111** communicates with each of the smartphones **200**A, **200**B, and **200**C via the communication I/F **112** to transmit and receive data. In addition, the communication I/F **112** can communicate with a computer connected to the Internet via the wireless base station and the network.

The short-range communicator **119** wirelessly communicates with the smartphones **200**A, **200**B, and **200**C based on a generic access profile (GAP) of the Bluetooth (registered trademark) standard, or the like. For example, once a distance to the smartphone **200**A becomes equal to or less than a communicable distance, the short-range communicator **119** communicates with the smartphone **200**A. The communicable distance of the short-range communicator **119** is several meters. In addition, the short-range communicator **119** may communicate using a short-range wireless communication technique of near field communication (NFC). In this case, the communicable distance of the short-range communicator **119** is several centimeters.

The facsimile **116** is connected to the public switched telephone networks (PSTN) and transmits facsimile data to the PSTN or receives facsimile data from the PSTN. The facsimile **116** stores the received facsimile data to the HDD **115** or outputs it to the image former **140**. The image former **140** prints the facsimile data received by the facsimile **116** on a sheet. In addition, the facsimile **116** converts data stored in the HDD **115** into facsimile data to transmit to a facsimile device connected to the PSTN.

The CD-ROM **118** is attached to the external storage device **117**. The CPU **111** can access the CD-ROM **118** via the external storage device **117**. The CPU **111** loads a program recorded in the CD-ROM **118** attached to the external storage device **117** into the RAM **114** to execute. Note that a medium storing the program to be executed by the CPU **111** is not limited to the CD-ROM **118** and may be an optical disk (magnetic optical disc (MO)/mini disc (MD)/digital versatile disc (DVD)), an IC card, an optical card, or a semiconductor memory such as a mask ROM, an erasable programmable ROM (EPROM), or an electrically EPROM (EEPROM).

In addition, the program executed by the CPU **111** is not limited to the program recorded in the CD-ROM **118** and a program stored in the HDD **115** may be loaded into the RAM **114** to be executed. In this case, another computer connected to the network may rewrite the program stored in the HDD **115** of the MFP **100** or writes a new program to add. Furthermore, the MFP **100** may download a program from another computer connected to the network and store this program to the HDD **115**. The program mentioned herein includes not only a program directly executable by the CPU **111** but also a source program, a program subjected to compression processing, an encrypted program, and so on.

Since the basic hardware configuration and functions of the smartphones **200**A, **200**B, and **200**C are the same, the smartphone **200**A will be described here as an example.

FIG. **3** is a block diagram illustrating an outline of the hardware configuration of the smartphone according to the present embodiment. Referring to FIG. **3**, the smartphone **200**A according to one or more embodiments includes a CPU **201** for controlling the entirety of the smartphone **200**A, a camera **202**, a flash memory **203** that stores data in a nonvolatile manner, a wireless communicator **204** connected to a telephone caller **205**, a display **206** that displays information, an operation member **207** that accepts user's operation, a wireless LAN I/F **208**, a short-range communicator **209**, a GPS receiver **210**, an external storage device **211**.

The display **206** is a display device such as a liquid crystal display (LCD) device or an organic ELD and displays an instruction menu for the user, information regarding the acquired image data, and the like. The operation member **207** includes a main key **207**A and a touch panel **207**B. In addition, when the user gives an instruction on the display surface of the display **206**, the operation member **207** outputs a position on the display surface detected by the touch panel **207**B to the CPU **201**. Based on the position detected by the touch panel **207**B, the CPU **201** detects a position instructed by the user on the screen displayed on the display **206**. Based on the screen displayed on the display **206** and the position detected by the touch panel **207**B, the CPU **201** accepts the input of data such as various instructions, characters, and numbers by the user's operation. For example, when a screen including an image of a numeric keypad is displayed on the display **206**, a number corresponding to a key displayed at a position detected by the touch panel **207**B is accepted.

The camera **202** includes a lens and a photoelectric conversion element and focuses light condensed by the lens on the photoelectric conversion element. The photoelectric conversion element photoelectrically converts the received light and outputs image data to the CPU **201**. The photoelectric conversion element is a complementary metal oxide semiconductor (CMOS) sensor, a charge coupled device (CCD) sensor, or the like.

The wireless communicator **204** wirelessly communicates with a mobile phone base station connected to a telephone communication network. The wireless communicator **204** connects the smartphone **200**A to the telephone communication network and allows a call using the telephone caller **205**. The wireless communicator **204** decodes a sound signal obtained by demodulating a wireless signal received from the mobile phone base station to output to the telephone caller **205**. In addition, the wireless communicator **204** encodes sound input from the telephone caller **205** to transmit to the mobile phone base station. The telephone caller **205** includes a microphone and a speaker and outputs sound input from the wireless communicator **204** through the speaker, while outputting sound input from the microphone to the wireless communicator **204**. Furthermore, the

wireless communicator **204** is controlled by the CPU **201** so as to connect the smartphone **200**A to an e-mail server and transmit and receive an e-mail.

The wireless LAN I/F **208** is an interface for communicating with a wireless station connected to the network and connecting the smartphone **200**A to the network. By registering an Internet protocol (IP) address of the MFP **100** to the smartphone **200**A, the smartphone **200**A can communicate with the MFP **100**, thereby being able to transmit and receive data.

The short-range communicator **209** wirelessly communicates with another device, for example, the MFP **100** based on the GAP of the Bluetooth (registered trademark) standard, or the like. The short-range communicator **209** communicates with the MFP **100** when, for example, a distance to the MFP **100** becomes equal to or less than the communicable distance. The communicable distance of the short-range communicator **209** is several meters. In addition, the short-range communicator **209** may communicate using the short-range wireless communication technique of the NFC. In this case, the communicable distance of the short-range communicator **209** is several centimeters.

The GPS receiver **210** receives a signal issued from a global positioning system (GPS) satellite and detects a current position based on the received signal. The current position is, for example, latitude and longitude. The GPS receiver **210** outputs the detected current position to the CPU **201**.

The flash memory **203** stores a program executed by the CPU **201** or data necessary for executing the program. The CPU **201** loads the program recorded in the flash memory **203** into a RAM included in the CPU **201** to execute.

The external storage device **211** is freely attachable to and detachable from the smartphone **200**A and a CD-ROM **211**A storing a remote operation program can be attached to the external storage device **211**. The CPU **201** can access the CD-ROM **211**A via the external storage device **211**. The CPU **201** can load the remote operation program recorded in the CD-ROM **211**A attached to the external storage device **211** into the RAM included in the CPU **201** to execute.

Although the program recorded in the flash memory **203** or the CD-ROM **210**A has been described as the program executed by the CPU **201**, a program obtained by another computer connected to the network by rewriting the program stored in the flash memory **203** or writing a new program to add may be employed. Additionally, a program downloaded by the smartphone **200**A from another computer connected to the network may be employed. The program mentioned herein includes not only a program directly executable by the CPU **201** but also a source program, a program subjected to compression processing, an encrypted program, and so on.

Note that a medium storing the program executed by the CPU **201** is not limited to the CD-ROM **211**A and may be an optical disk (MO/MD/DVD), an IC card, an optical card, or a semiconductor memory such as a mask ROM, an EPROM, or an EEPROM.

FIG. **4** is a block diagram illustrating an example of functions of the CPU included in the MFP according to one or more embodiments. The functions illustrated in FIG. **4** are functions formed in the CPU **111** included in the MFP **100** when the CPU **111** executes cooperative programs stored in the ROM **113**, the HDD **115**, and the CD-ROM **118**.

Referring to FIG. **4**, the CPU **111** included in the MFP **100** includes a device-side setter **11**, a device-side executor **13**, a device detector **15**, a path establisher **17**, a release informer **19**, a cooperation mode switcher **21**, a device-side acceptor **23**, a related image display **25**, a remote operator **27**, and a notifier **29**.

The device detector **15** controls the touch panel **165** and the short-range communicator **119** to detect a device from among the smartphones **200**A, **200**B, and **200**C when this device is placed on the display surface of the display **161**. When a device from among the smartphones **200**A, **200**B, **200**C, for example, the smartphone **200**A is placed on the display surface of the display **161**, the touch panel **165** detects a position on the display surface of the display **161** where the smartphone **200**A is placed. Since the area of the display surface of the display **161** with which the smartphone **200**A makes contact is larger than the area of the finger of the user, an upper limit of the area of the finger of the user is defined in advance as a threshold value such that the touch panel **165** judges that the smartphone **200**A is placed in a case where the area of a region where the touch panel **165** detects the contact with an object is equal to or larger than the threshold value, while detecting an instruction by the user with the finger in a case where the area of a region where the touch panel **165** detects the contact with an object is smaller than the threshold value.

In response to the touch panel **165** detecting a position where the smartphone **200**A is placed, the device detector **15** controls the short-range communicator **119** to transmit a search command for searching for a device present therearound. When receiving the search command, each of the smartphones **200**A, **200**B, and **200**C returns a response command including device identification information for identifying the own device. A network address allocated in the network can be used as the device identification information. The network address is, for example, an Internet protocol address (IP address) or a media access control (MAC) address. When placed on the display surface of the display **161**, the smartphone **200**A receives the search command and thus returns the response command. Upon receiving the response command returned by the smartphone **200**A, the device detector **15** detects that the device placed at a position first detected by the touch panel **165** is the smartphone **200**A. When detecting the smartphone **200**A, the device detector **15** registers the smartphone **200**A as a cooperating device. Specifically, the device detector **15** stores, to the RAM **114**, cooperating device information constituted by a pair of the device identification information on the smartphone **200**A and position information indicating the position where this smartphone **200**A is placed and also outputs a cooperation instruction to the cooperation mode switcher **21** and the path establisher **17**. The cooperation instruction includes the device identification information included in the cooperating device information stored in the RAM **114**.

When the position specified by the position information paired with the device identification information on the smartphone **200**A is no longer detected by the touch panel **165**, the device detector **15** judges that the smartphone **200**A has left the display surface of the display **161** and deletes the smartphone **200**A from the cooperating device. Specifically, the device detector **15** erases the pair of the device identification information and the position information on the smartphone **200**A stored in the RAM **114** and also outputs, to the related image display **25** and the remote operator **27**, a detachment signal including the device identification information on the smartphone **200**A and the position information indicating the position on the display surface of the display **161** on which the smartphone **200**A was placed.

Here, when controlling the short-range communicator **119** to transmit the search command in response to the touch panel **165** detecting the position where the smartphone **200**A is placed, the device detector **15** receives a response command from the smartphone **200**B or **200**C in some cases in addition to the response command received from the smartphone **200**A. In this case, the device detector **15** excludes, from a processing target, a response command including device identification information included in exclusion device information to be described later, among the plurality of response commands. Additionally, the device detector **15** settles, as a processing target, a response command whose device identification information included therein is not included in any of the cooperating device information stored in the RAM **114** from among the response commands to be treated as processing targets. When one response command is settled as a processing target, the device detector **15** judges that a device specified by the device identification information included in the one response command is placed at a position detected by the touch panel **165**.

There is a case where a plurality of response commands is settled by the device detector **15** as processing targets. Examples include a case where another user B is near the MFP **100** while carrying a smartphone **200**B but without placing it on the display surface of the display **161**. In this case, the device detector **15** controls the display **161** to display, in the vicinity of the position detected by the touch panel **165**, an inquiry screen in which a plurality of items of the device identification information individually included in the plurality of response commands can be selected. If the user carrying the smartphone **200**A selects the device identification information on the smartphone **200**A in accordance with the inquiry screen, the device detector **15** judges that a device placed at a position first detected by the touch panel **165** is the smartphone **200**A and also stores, to the RAM **114**, the cooperating device information constituted by a pair of the device identification information on the smartphone **200**A and the position information indicating a position where this smartphone **200**A is placed, while storing unselected device identification information to the RAM **114** as the exclusion device information.

Note that the device detector **15** may authenticate the user before storing the cooperating device information to the RAM **114**. For example, authentication information in which user identification information on a user authorized to use the MFP **100** is associated with the device identification information on a device allocated to this user is stored in advance to the HDD **115** and, in a case where the authentication information including the device identification information included in the cooperating device information is stored in the HDD **115**, the cooperating device information is stored to the RAM **114**. Meanwhile, in a case where the authentication information including the device identification information included in the cooperating device information is not stored in the HDD **115**, the device detector **15** does not store the cooperating device information to the RAM **114** but stores the device identification information included in the cooperating device information to the RAM **114** as the exclusion device information. As a result, only the user registered in advance to the MFP **100** can be allowed to use the MFP **100**.

The path establisher **17** controls the short-range communicator **119** to negotiate with a device specified by the device identification information included in the cooperation instruction and establishes a communication path. For example, when the smartphone **200**A is placed on the display surface of the display **161** by the user A, since the smartphone **200**A is detected by the device detector **15**, the path establisher **17** establishes a communication path with the smartphone **200**A. Upon establishing a communication path with the smartphone **200**A, the path establisher **17** outputs a pair of the device identification information on the smartphone **200**A and path identification information for identifying the communication path to the cooperation mode switcher **21** and the release informer **19**. When the established communication path is disconnected, the path establisher **17** outputs a disconnection signal including the path identification information on the disconnected path to the notifier **29**. A case where the communication path is disconnected includes, for example, a case where the smartphone **200**A goes out of a communicable range of the short-range communicator **119** and a case where the smartphone **200**A disconnects the communication path. Note that the path establisher **17** may control the communication I/F **112** to establish a communication path with the smartphone **200**A.

The cooperation mode switcher **21** switches an action mode to either an independent mode or a cooperation mode. The cooperation mode switcher **21** switches the action mode for each of the smartphones **200**A, **200**B, and **200**C. In one or more embodiments, since a plurality of users operates the MFP **100** at the same time, the action mode is switched for each user. The action mode of the MFP **100** is sometimes different depending on the user. Therefore, the cooperation mode switcher **21** settles the action mode corresponding to the device identification information. For example, the cooperation mode switcher **21** switches the action mode for the smartphone **200**A to either the cooperation mode for working in cooperation with the smartphone **200**A or the independent mode for working independently without cooperating with the smartphone **200**A. The cooperation mode switcher **21** outputs the device identification information and an action mode signal indicating one action mode from among the independent mode and the cooperation mode to the device-side setter **11** and the remote operator **27**.

The cooperation mode switcher **21** includes a cooperation setter **35** and a releaser **37**. The cooperation setter **35** switches the action mode from the independent mode to the cooperation mode, while the releaser **37** switches the action mode from the cooperation mode to the independent mode. In response to the input of a cooperation instruction from the device detector **15** and the input of a pair of the device identification information same as the device identification information included in the cooperation instruction and the path identification information from the path establisher **17**, the cooperation setter **35** switches the action mode corresponding to the device identification information from the independent mode to the cooperation mode.

In response to the reception of a cooperation end signal from the smartphone **200**A via the communication path with the smartphone **200**A established by the path establisher **17**, the release informer **19** controls the communication I/F **112** to output a cooperation end instruction to the releaser **37**. The cooperation end instruction includes the device identification information on the smartphone **200**A that has transmitted the cooperation end signal.

In response to the input of the cooperation end instruction from the release informer **19**, the releaser **37** switches the action mode corresponding to the device identification information included in the cooperation end instruction from the cooperation mode to the independent mode. In addition, there is a case where a cooperation end instruction is input to the releaser **37** from the device-side acceptor **23** or the device-side executor **13**, which will be described later. Although the details of the cooperation end instruction

output by the device-side acceptor **23** will be described later, for example, in a case where the user A inputs an operation instructing the end of the cooperative processing, the cooperation end instruction is output from the device-side acceptor **23** in response to the acceptance of this operation by the device-side acceptor **23**, while includes the device identification information on the smartphone **200**A carried by the user A. When the cooperation end instruction is input from the device-side acceptor **23**, the releaser **37** switches the action mode corresponding to the device identification information included in the cooperation end instruction from the cooperation mode to the independent mode and also outputs a notification instruction to the release informer **19**. The notification instruction includes the device identification information included in the cooperation end instruction.

In response to the input of the notification instruction, the release informer **19** refers to a pair of the device identification information and the path identification information input from the path establisher **17** to specify the path identification information paired with the device identification information included in the cooperation end instruction and controls the communication I/F **112** to transmit the cooperation end signal indicating the end of the cooperative processing to the smartphone **200**A via the specified path identification information. As a result, the user A can end cooperation between the MFP **100** and the smartphone **200**A by operating the MFP **100** and can confirm with the smartphone **200**A that the cooperation has ended.

The device-side executor **13** is capable of executing a plurality of items of processing. The plurality of items of processing that can be executed by the device-side executor **13** includes document reading processing, image formation processing, data transmission and reception processing, facsimile transmission and reception processing, and data management processing. The processing executable by the device-side executor **13** includes processing obtained by combining at least two of the document reading processing, the image formation processing, the data transmission and reception processing, the facsimile transmission and reception processing, and the data management processing. Note that the processing executable by the device-side executor **13** is not limited to these items of processing and may be less or may include more types of processing. Hereinafter, the processing executed by the device-side executor **13** is referred to as device-side processing.

The document reading processing is processing of storing image data obtained by reading a document with the document reader **130** to the RAM **114**. Setting values used for executing the document reading processing include a reading surface of the document, whether the document is in color or monochrome, reading resolution, image quality, density, whether to use a stamp or page printing, frame elimination for deleting the periphery of the read image, whether to perform image processing such as sharpening, the file format and name of image data to be stored to the RAM **114**, the size of the document, the number of documents, and the type of the document. The type of the document includes whether the documents include a different size and a book document indicating that a plurality of pages are formed.

The image formation processing is processing of causing the image former **140** to form an image of data on a sheet supplied from the paper feeder **150**. Setting values used for executing the image formation processing include, for example, whether to use color or monochrome, paper size, type of paper, the number of copies, designation of paper feed tray, whether to perform post-processing, a surface on which an image is formed (one-sided or double-sided), and the orientation of the document. Whether to perform post-processing includes whether to perform sorting, stapling, punching, and so on.

The data transmission and reception processing is processing of receiving data from a computer connected to the network via the communication I/F **112** or processing of transmitting data stored in the HDD **115** or the external storage device **117** to a computer connected to the network via the communication I/F **112**. Setting values used for executing the data transmission and reception processing include, for example, data resolution, whether to use color or monochrome, and file format.

The facsimile transmission and reception processing is processing of causing the facsimile **116** to transmit an image of facsimile data or processing of receiving an image of facsimile data from the outside. Setting values used for executing the facsimile transmission and reception processing include, for example, setting of a facsimile line, setting value designating the time of transmission, password, and F code.

The data management processing is processing of storing data to the HDD **115** or the external storage device **117**, processing of modifying or deleting data stored in the HDD **115** or the external storage device **117**, processing of selecting one or more pieces of data from data stored in the HDD **115** or the external storage device **117** as processing targets. The processing of modifying data includes processing of editing data and processing of changing the format. Setting values used for executing the data management processing are, for example, folder name when a folder is created in the HDD **115**, password set for the folder, search character string for searching data, folder type, and the time to delete the document.

The device-side setter **11** includes a device operation screen display **31** and a device-side setting value setter **33**. The device operation screen display **31** displays an operation screen on the display **161** for each of the users A, B, and C. The operation screen includes a processing selection screen for selecting one of a plurality of items of processing executable by the device-side executor **13** and a setting value selection screen for setting a setting value used for executing the selected processing.

The device operation screen display **31** displays the processing selection screen within a predetermined range from a position on the display surface of the display **161** where the smartphone **200**A is placed. For example, the user A is located near a position on the display surface of the display **161** where the smartphone **200**A is placed. The device operation screen display **31** outputs the processing selection screen and the position of the processing selection screen on the display surface of the display **161** to the device-side acceptor **23**. When a position detected by the touch panel **165** is located within the processing selection screen after the processing selection screen is input from the device operation screen display **31**, the device-side acceptor **23** accepts an operation input by the user A on the processing selection screen. Specifically, the device-side acceptor **23** accepts an operation of selecting the device-side processing based on a position instructed by the user A on the processing selection screen and outputs processing identification information for identifying the device-side processing to the device-side setting value setter **33**.

In response to the selection of the device-side processing, the device operation screen display **31** displays the setting value selection screen for setting a setting value used for executing this device-side processing on the display **161** in

the vicinity of the processing selection screen. The device operation screen display **31** outputs the setting value selection screen and the position of the setting value selection screen on the display surface of the display **161** to the device-side acceptor **23**. When a position detected by the touch panel **165** is located within the setting value selection screen after the setting value selection screen is input from the device operation screen display **31**, the device-side acceptor **23** accepts an operation input by the user A on the setting value selection screen. Specifically, the device-side acceptor **23** accepts an operation of selecting a setting value as a device setting value based on a position instructed by the user A on the setting value selection screen and outputs the device setting value to the device-side setting value setter **33**.

When accepting an operation instructing the execution of the cooperative processing, the device-side acceptor **23** outputs an execution instruction to the device-side executor **13** and the remote operator **27**. For example, the processing selection screen includes a button for instructing the execution of the cooperative processing such that the device-side acceptor **23** accepts an operation instructing the execution of the cooperative processing in a case where a position detected by the touch panel **165** is located within the button for instructing the execution of the cooperative processing.

The device-side setting value setter **33** sets the device-side processing specified by the processing identification information in response to the input of the processing identification information from the device-side acceptor **23** and sets the device-side setting value in response to the input of the device-side setting value from the device-side acceptor **23**.

In response to the input of the execution instruction from the device-side acceptor **23**, the device-side executor **13** executes the device-side processing set by the device-side setting value setter **33** in accordance with the device-side setting value. For example, when detecting an operation input by the user A instructing the execution of the cooperative processing, the device-side executor **13** executes the device-side processing in cooperation with the smartphone **200**A in accordance with the device-side setting value. Specifically, the device-side executor **13** acquires the execution state of the portable-side processing executed by the smartphone **200**A from the smartphone **200**A and executes the device-side processing in synchronization with the portable-side processing executed by the smartphone **200**A. When the device-side processing is to be executed before the portable-side processing, the device-side executor **13** executes the device-side processing after confirming a state of the portable-side processing being executable by the smartphone **200**A. Meanwhile, when the device-side processing is to be executed after the portable-side processing, the device-side executor **13** executes the device-side processing after confirming that the portable-side processing has ended in the smartphone **200**A. When the device-side executor **13** has ended the execution of the device-side processing, the cooperation end instruction is output to the releaser **37**. The cooperation end instruction includes the device identification information on the smartphone **200**A carried by the user A.

In response to the input of the detachment signal from the device detector **15**, the related image display **25** displays a related image relating to the device identification information included in the detachment signal on the display surface of the display **161** at a position specified by the position information included in the detachment signal. As a result, for example, when the smartphone **200**A leaves the display surface of the display **161**, the related image relating to the smartphone **200**A is displayed at a position where the smartphone **200**A was placed and thus, the fact that the user A is operating the MFP **100** can be notified. In addition, when the user A returns near the MFP **100** again, the user A can confirm the own position.

The related image display **25** may include at least one of an identification information display **41**, a virtual image display **43**, a portable screen display **45**, and an application display **47**. The identification information display **41** displays an image of the device identification information included in the detachment signal on the display **161** as the related image. The identification information display **41** displays an image of the device identification information included in the detachment signal as the related image on the display surface of the display **161** at a position specified by the position information included in the detachment signal. The virtual image display **43** displays a virtual image imitating the appearance of a device specified by the device identification information included in the detachment signal, here, the smartphone **200**A as the related image on the display surface of the display **161** at a position specified by the position information included in the detachment signal.

The portable screen display **45** acquires an image of a screen displayed on a device specified by the device identification information included in the detachment signal, here, the smartphone **200**A from the smartphone **200**A and displays the acquired image of the screen as the related image on the display surface of the display **161** at a position specified by the position information included in the detachment signal. While the virtual image is displayed by the virtual image display **43**, the portable screen display **45** superimposes the image of the screen acquired from the smartphone **200**A on a portion equivalent to a display of the smartphone **200**A in the virtual image to display.

The smartphone **200**A serving as the cooperating device sometimes executes an application program different from the cooperative program for cooperating with the MFP **100** and, when executing such an application program, transmits application identification information for identifying this application program to the MFP **100**. When the communication I/F **112** receives the application identification information from a device specified by the device identification information included in the detachment signal, here, the smartphone **200**A, the application display **47** judges whether the application program in the received application identification information is a program defined in advance. The program defined in advance is, for example, an application program for calling and an application program for receiving an e-mail. When the application identification information received from the smartphone **200**A indicates one of the programs defined in advance, the application display **47** displays an image of this application identification information as the related image on the display surface of the display **161** at a position specified by the position information included in the detachment signal.

The notifier **29** displays a message on the display **161** in response to the input of the detachment signal from the path establisher **17**. For example, the notifier **29** displays a message requesting the establishment of the communication path on the display surface of the display **161** at a position specified by the position information included in the detachment signal.

In response to the input of the detachment signal from the device detector **15** while the action mode signal indicating the cooperation mode is input from the cooperation mode switcher **21**, the remote operator **27** remotely operates a device specified by the device identification information

included in the detachment signal. A case where the detachment signal includes the device identification information on the smartphone **200**A will be described here as an example. The remote operator **27** includes a portable candidate value acquirer **51**, a portable candidate value display **53**, and a setting instructor **55**. The portable candidate value acquirer **51** controls the communication I/F **112** to acquire a portable candidate value from the smartphone **200**A. The portable candidate value is one or more items of the processing identification information on processing that can be set as the portable-side processing or one or more setting values that can be set as the portable-side setting values on a setting screen displayed at that time point in the smartphone **200**A. The portable candidate value acquirer **51** outputs the acquired one or more portable candidate values to the portable candidate value display **53**.

The portable candidate value display **53** displays one or more portable candidate values acquired by the portable candidate value acquirer **51** in a selectable manner on the display surface of the display **161** at a position specified by the position information included in the detachment signal. At this time point, since the related image is displayed by the related image display **25** on the display surface of the display **161** at a position specified by the position information included in the detachment signal, the portable candidate value may be displayed so as to be superimposed on the related image or may be displayed around the related image so as not to overlap with the related image. When the portable candidate value is displayed so as not to overlap with the related image, the visibility of the portable candidate value and the related image is improved in a case where the related image includes a character or the like, which is thus effective. When there is a plurality of portable candidate values, all of the plurality of portable candidate values are displayed at a time. Note that, when there is no space for displaying all of the plurality of portable candidate values at a time, the plurality of portable candidate values may be displayed in a scrollable state. Specifically, a predetermined number of portable candidate values are displayed at a time from among a plurality of portable candidate values and, in response to the acceptance of a scroll operation, one or more portable candidate values that were not displayed are displayed at a different time.

The portable candidate value display **53** outputs one or more portable candidate values and the position information indicating respective positions of the one or more portable candidate values on the display surface of the display **161** to the device-side acceptor **23**. After the one or more portable candidate values and the position information on each of the one or more portable candidate values are input from the portable candidate value display **53**, the device-side acceptor **23** accepts an operation of the user A selecting the one or more portable candidate values in a case where a position detected by the touch panel **165** matches a position specified by the position information on each of the one or more portable candidate values. The device-side acceptor **23** outputs the portable candidate value specified by the accepted operation to the setting instructor **55**. In response to the input of the portable candidate value from the device-side acceptor **23**, the setting instructor **55** controls the communication I/F **112** to transmit a setting instruction instructing to set the portable candidate value to a device specified by the device identification information included in the detachment signal, here, the smartphone **200**A. The setting instruction includes the portable candidate value input from the device-side acceptor **23**. As a result, although the details of the smartphone **200**A receiving the setting instruction will be described later, the portable-side processing or the portable candidate value is set in accordance with the setting instruction. In addition, there is a case where the setting instructor **55** accepts the input of the execution instruction from the device-side acceptor **23**. In response to the input of the execution instruction from the device-side acceptor **23**, the setting instructor **55** controls the communication I/F **112** to transmit the execution instruction to the smartphone **200**A specified by the device identification information included in the detachment signal. Although the details of the smartphone **200**A receiving the execution instruction will be described later, the portable-side processing set up to then is executed in cooperation with the MFP **100** in accordance with the portable candidate value by following the execution instruction.

While one or more of the one or more portable candidate values displayed by the portable candidate value display **53** are being selected, the device-side acceptor **23** can accept an operation input on the operation screen displayed by the device-side setting value setter **33**. In addition, while the device-side processing or the device-side setting value is being selected on the operation screen displayed by the device-side setting value setter **33**, the device-side acceptor **23** can accept an operation of selecting one or more portable candidate values displayed by the portable candidate value display **53**.

The device-side acceptor **23** accepts respective operations corresponding to two different positions by a drag-and-drop operation. The device-side acceptor **23** accepts a drag-and-drop operation based on a position detected by the touch panel **165** on the display surface of the display **161** with the lapse of time. The device-side acceptor **23** accepts an operation continuously instructing the same position on the display surface of the display **161** for a predetermined time as a drag operation. In the drag operation, a position continuously instructed for a predetermined time is specified. The device-side acceptor **23** accepts an operation ending the instruction at a position different from the position of the drag operation after the drag operation as a drop operation. In the drop operation, the last instructed position before the instruction ends is specified. This means that the user moves his/her finger on the display surface of the display **161** from the position specified by the drag operation to the position specified by the drop operation.

Specifically, when accepting the drag operation on one of the one or more portable candidate values displayed by the portable candidate value display **53**, the device-side acceptor **23** puts the portable candidate value displayed at a position specified by the drag operation into a selected state and also outputs a setting instruction including the portable candidate value to the setting instructor **55**. Then, when a position within the operation screen displayed by the device operation screen display **31** is specified by the drop operation, an operation of selecting the processing identification information or the setting value displayed at the position specified by the drop operation is accepted and the device-side setting value setter **33** is caused to set the device-side processing or the setting value. In this case, while the user is moving his/her finger from the position specified by the drag operation to the position specified by the drop operation on the display surface of the display **161**, the portable candidate value selected by the drag operation be displayed at a position instructed by the user such that the portable candidate value is moved and displayed as the user's finger moves.

For example, when data identification information on data stored in the smartphone **200**A is specified as the portable

candidate value by the drag operation and the processing identification information on the image formation processing is specified by the drop operation during the drag-and-drop operation, the cooperative processing for forming an image of the data stored in the smartphone **200**A with the MFP **100** is set.

In addition, when a position within the operation screen displayed by the device operation screen display **31** is specified by the drag operation, the device-side acceptor **23** accepts an operation of selecting the processing identification information or the setting value displayed at the position specified by the drag operation to put the processing identification information or the setting value into a selected state and also causes the device-side setting value setter **33** to set the device-side processing or the setting value. Then, when the position of one of the one or more portable candidate values displayed by the portable candidate value display **53** is specified by the drop operation, the portable candidate value displayed at the position specified by the drop operation is selected and a setting instruction including the portable candidate value is output to the setting instructor **55**.

For example, when the processing identification information on the document reading processing is specified by the drag operation and an e-mail address is specified as the portable candidate value by the drop operation during the drag-and-drop operation, the cooperative processing is set in which the smartphone **200**A transmits an e-mail addressed to the specified e-mail address, which includes image data obtained by the MFP **100** reading the document.

FIG. **5** is a diagram illustrating an example of the operation screen according to one or more embodiments. Referring to FIG. **5**, an operation screen **300** is displayed in a partial region of the display surface of the display **161** including a position where the smartphone **200**A is placed. The operation screen **300** includes an independent region **301** valid in the independent mode, a setting value region **303** in which a setting screen for setting the setting value is displayed, and a cooperation region **305** valid in the cooperation mode. Note that dotted lines in FIG. **5** are provided for distinguishing the independent region **301**, the setting value region **303**, and the cooperation region **305** and actually do not exist. In order to distinguish the independent region **301**, the setting value region **303**, and the cooperation region **305**, boundary lines may be provided to the operation screen **300**, or background colors of the independent region **301**, the setting value region **303**, and the cooperation region **305** may be made different.

The independent region **301** can accept an operation by the user while the action mode is the independent mode. The independent region **301** includes a plurality of buttons for selecting device independent processing. The plurality of buttons here includes a button for selecting the document reading processing and the image formation processing labeled with characters of "Copy", a button for selecting the document reading processing labeled with characters of "Scan", a button for selecting the data management processing and the image formation processing labeled with characters of "Print", a button for selecting the data transmission and reception processing labeled with characters of "Transmit", and a button for selecting the data management processing labeled with characters of "Box".

The cooperation region **305** can accept an operation by the user while the action mode is the cooperation mode. The cooperation region **305** includes a position where the smartphone **200**A is placed and includes a plurality of buttons for selecting the portable-side processing around a region where the smartphone **200**A is placed. The plurality of buttons here includes a button for selecting the data transmission and reception processing labeled with characters of "Transmit", a button for selecting the image formation processing labeled with characters of "Print", four buttons for selecting the data management processing individually labeled with characters of "Box", "Preview", "OCR", and "edit".

In the setting value region **303**, a setting screen for setting a device independent setting value used for executing the device independent processing selected in the independent region **301** is displayed in the case of the independent mode, while a setting screen for setting the device-side setting value used for executing the device-side processing selected in the cooperation region **305** is displayed in the case of the cooperation mode.

During the independent mode, the user can select the device independent processing and set the device independent setting value by inputting an operation to the independent region **301** and the setting value region **303**. Meanwhile, during the cooperation mode, the user can select the device-side processing and set the device-side setting value by inputting an operation to the cooperation region **305** and the setting value region **303** and also can select the portable-side processing and set the portable-side setting value by operating the smartphone **200**A.

FIG. **6** is a diagram illustrating an example of the operation screen in a state in which the smartphone has been detached according to one or more embodiments. A difference from FIG. **5** is that a related image **311** and a portable candidate value **321** are included instead of the smartphone **200**A. The related image **311** includes an identification information image **313**, a virtual image **315**, and a screen image **317**. The identification information image **313** is an image of a character string of identification information "Smartphone A" on the smartphone **200**A. The virtual image **315** is an image imitating the appearance of the smartphone **200**A and is equivalent to a hatched portion in FIG. **6**. The screen image **317** is an image of a screen displayed on the smartphone **200**A. The screen image **317** here is arranged within the virtual image **315** at a position equivalent to a display surface of a display **26** of the smartphone **200**A. The screen image indicates an image of a setting screen enumerating file names used for selecting a file.

The portable candidate value **321** is a setting value that can be selected on a setting screen displayed on the smartphone **200**A. Since a case where a setting screen for selecting a file is displayed on the smartphone **200**A is indicated here as an example, the portable candidate value **321** is illustrated as file names "A" to "L".

In addition, the portable candidate value **321** of the file name "A" is illustrated with hatching provided and indicates a state thereof being selected by the user by the drag operation. For example, if the portable candidate value **321** of the file name "A" is moved until it overlaps with the button for selecting the image formation processing labeled with characters of "Print" and the drop operation is then performed, data having the file name "A" is set as the portable setting value and the image formation processing is set as the device-side processing. In this case, the cooperative processing may be executed as processing of forming an image of the data having the file name "A". In this case, the device setting value can be assigned by a setting value set for the image formation processing at that time point.

FIG. **7** is a diagram illustrating an example of functions provided in the CPU included in the smartphone according to one or more embodiments. The functions illustrated in FIG. **7** are functions formed in the CPU **201** included in the

smartphone **200**A when the CPU **201** executes portable-side cooperative programs stored in the flash memory **203** and the CD-ROM **211**A. The portable-side cooperative program is a part of the cooperative program. Hereinafter, a task in which the CPU **201** executes the portable-side cooperative program is referred to as a cooperative task.

Referring to FIG. **7**, the CPU **201** includes a portable-side setter **251**, a portable-side executor **253**, a portable-side acceptor **255**, a remote controller **257**, a communication controller **259**, a cooperation end notifier **261**, and an application notifier **263**.

The CPU **201** executes a plurality of types of application programs. Description will be made here using as an example a case where the smartphone **200**A is installed with at least the portable-side cooperative program, an application program enabling a telephone call, an application program transmitting and receiving an e-mail, and a browsing program for browsing a Web page arranged on the Internet. Note that the application programs installed in the smartphone **200**A are not limited to these programs. Hereinafter, a task in which the CPU **201** executes the portable-side cooperative program is referred to as a cooperative task, whereas a task in which the CPU **201** executes an application program other than the portable-side cooperative program is referred to as an application task. The application program other than the portable-side cooperative program here is the application program enabling a telephone call, the application program transmitting and receiving an e-mail, and the browsing program. The portable-side setter **251**, the portable-side executor **253**, the portable-side acceptor **255**, the remote controller **257**, the communication controller **259**, the cooperation end notifier **261**, and the application notifier **263** are the cooperative tasks. The portable-side setter **251** can be the application task.

The portable-side executor **253** can execute a plurality of types of processing. The plurality of types of processing that can be executed by the portable-side executor **253** is settled by application programs installed in the smartphone **200**A. When the application task is in a current state, the portable-side executor **253** outputs the application identification information for identifying this application program to the application notifier **263**. The application identification information is, for example, the name of the application program. The current state is a state in which an operation by the user input to the operation member **207** can be accepted, whereas a non-current state is a state in which an operation by the user input to the operation member **207** cannot be accepted.

The portable-side setter **251** includes a portable setting screen display **271** and a portable-side setting value setter **273**. The portable setting screen display **271** displays a setting screen on the display **206**. The portable-side setter **251** outputs the setting screen displayed on the display **206** to the portable-side acceptor **255**. The setting screen includes a processing selection screen for selecting one of a plurality of types of processing executable by the portable-side executor **253** and a setting value selection screen for setting a setting value used for executing the selected processing.

When a position detected by the touch panel **207**B is located within the setting screen after the setting screen is input from the portable setting screen display **271**, the portable-side acceptor **255** accepts an operation input by the user A to the setting screen. Specifically, the portable-side acceptor **255** accepts an operation of selecting the portable-side setting value based on a position instructed by the user A on the setting value selection screen and outputs the portable-side setting value to the portable-side setting value setter **273**.

There is a case where the portable-side acceptor **255** accepts an operation instructing the end of the cooperative processing. For example, the processing selection screen includes a button for instructing the end of the cooperative processing such that the portable-side acceptor **255** accepts an operation instructing the end of the cooperative processing in a case where a position detected by the touch panel **207**B is located within the button for instructing the end of the cooperative processing. When accepting an operation instructing the end of the cooperative processing, the portable-side acceptor **255** outputs the cooperation end instruction to the cooperation end notifier **261**.

The portable-side setting value setter **273** sets the portable-side processing specified by the processing identification information in response to the input of the processing identification information from the portable-side acceptor **255** and sets a setting value as the portable-side setting value in response to the input of this setting value from the portable-side acceptor **255**. The portable-side setting value setter **273** outputs a pair of the processing identification information for identifying the set portable-side processing and the portable-side setting value to the portable-side executor **253**.

The communication controller **259** controls the short-range communicator **209** to return a response command including the device identification information on the own device in response to the reception of the search command from the MFP **100**. Additionally, the communication controller **259** controls the short-range communicator **209** to negotiate with the MFP **100** in response to the reception of a connection request from the MFP **100** and establishes a communication path. The communication controller **259** outputs the device identification information on the MFP **100** and the path identification information for identifying the communication path established with the MFP **100** to the remote controller **257**, the application notifier **263**, and the cooperation end notifier **261**. In one or more embodiments, since the MFP **100** transmits the connection request to establish a communication path when the user A places the smartphone **200**A on the display surface of the display **161** of the MFP **100**, the communication controller **259** establishes a communication path once the user A places the smartphone **200**A on the display surface of the display **161** of the MFP **100**. Note that the communication controller **259** may control the wireless LAN I/F **208** to establish a communication path with the MFP **100** in response to the reception of the connection request from the MFP **100**.

The remote controller **257** includes a portable candidate value transmitter **281**, a setting controller **283**, and an execution instructor **285**. A setting screen is input to the portable candidate value transmitter **281** from the portable setting screen display **271**. The portable candidate value transmitter **281** specifies one or more candidate values defined on the setting screen. The candidate value is a setting value that can be set on the setting screen and includes the processing identification information on processing that can be set as the portable-side processing and the setting value that can be set as the portable-side setting value. The portable candidate value transmitter **281** controls the short-range communicator **209** to transmit the specified one or more candidate values to the MFP **100** via the communication path established by the communication controller **259** with the MFP **100**.

The setting controller **283** controls the short-range communicator **209** to receive the setting instruction from the MFP **100** via the communication path with the MFP **100** established by the communication controller **259**. The setting instruction is transmitted to the MFP **100** by the portable candidate value transmitter **281** and includes one of one or more portable candidate values to indicate an instruction to set the one of one or more portable candidate values as the portable-side processing or the portable setting value. In response to the input of the setting instruction, the setting controller **283** instructs the portable-side setting value setter **273** to set the portable candidate value included in the setting instruction. When setting of the portable candidate value is instructed by the setting controller **283**, the portable-side setting value setter **273** sets processing specified by the processing identification information as the portable-side processing in a case where the portable candidate value is the processing identification information and sets the setting value as the portable setting value in a case where the portable candidate value is the setting value.

The execution instructor **285** controls the short-range communicator **209** to receive the execution instruction from the MFP **100** via the communication path with the MFP **100** established by the communication controller **259**. The execution instruction indicates an instruction to execute the cooperative processing. In response to the reception of the execution instruction from the MFP **100**, the execution instructor **285** instructs the portable-side executor **253** to execute the portable-side processing.

In response to the instruction from the execution instructor **285** to execute the portable-side processing, the portable-side executor **253** executes the portable-side processing set by the portable-side setting value setter **273** in accordance with the portable-side setting value. Specifically, the portable-side executor **253** executes the portable-side processing in synchronization with the MFP **100**. For example, the portable-side executor **253** acquires an execution state of the device-side processing executed by the MFP **100** from the MFP **100** to execute the portable-side processing. When the portable-side processing is to be executed before the device-side processing, the portable-side processing is executed after a state of the device-side processing being executable by the MFP **100** is confirmed. When the portable-side processing is to be executed after the device-side processing, the portable-side processing is executed after the fact that the device-side processing has been ended by the MFP **100** is confirmed.

FIG. **8** is a flowchart illustrating an example of a flow of the cooperative processing according to one or more embodiments. The cooperative processing is processing executed by the CPU **111** included in the MFP **100** when the CPU **111** executes the cooperative programs stored in the ROM **113**, the HDD **115**, and the CD-ROM **118**. Referring to FIG. **8**, the CPU **111** executes device detection processing (step S**01**) and advances the processing to step S**04**.

FIG. **9** is a flowchart illustrating an example of a flow of the device detection processing according to one or more embodiments. Referring to FIG. **9**, the CPU **111** judges whether an object has made contact with the display surface of the display **161** (step S**21**). Specifically, when the touch panel **165** is controlled and the touch panel **165** detects a position with which the object has made contact, it is judged that the object has made contact with the display surface of the display **161**. The processing is advanced to step S**22** if the touch panel **165** has detected a position with which the object has made contact. Otherwise, the processing is returned to the cooperative processing.

In next step S**22**, it is judged whether the area of a region where the object is in contact with the display surface of the display **161** is equal to or larger than a predetermined size. The predetermined size is the upper limit of the area of the user's finger. This is for distinguishing between an instruction by a finger of a person and an instruction by the smartphone **200**A being laid down. The processing is advanced to step S**23** if the area of the region where the object has made contact with the display surface of the display **161** is equal to or larger than the predetermined size. Otherwise, the processing is advanced to step S**35**. In step S**35**, the user's instruction is set and the processing is returned to the cooperative processing.

In step S**23**, the short-range communicator **119** is controlled to transmit the search command. In response to the reception of the search command, one or more of the smartphones **200**A, **200**B, and **200**C that are present in a range communicable with the short-range communicator **119** individually return the response commands including the device identification information on the own devices. There is a case where, in addition to a device placed on the display surface of the display **161** but not registered in the cooperating device from among the smartphones **200**A, **200**B, and **200**C, a device not placed on the display surface of the display **161** or a device placed on the display surface of the display **161** and already registered in the cooperating device returns the response command. Hereinafter, a device that returns the response command is referred to as a candidate device. Therefore, in next step S**24**, the cooperating device and an exclusion device are excluded from the candidate devices. The exclusion device is a device to be registered as the exclusion device in step S**29** to be described later. The cooperating device is a device to be registered as the cooperating device in step S**30** to be described later. In next step S**25**, it is judged whether a candidate device is present. The processing is advanced to step S**26** if a candidate device is present. Otherwise, the processing is advanced to step S**34**. In step S**34**, an error message is displayed on the display **161** and the processing is returned to the cooperative processing.

In next step S**26**, it is judged whether a plurality of candidate devices is present. The processing is advanced to step S**27** if a plurality of candidate devices is present. Otherwise, the processing is advanced to step S**30**. In step S**30**, one candidate device is set as the cooperating device when the processing has proceeded from step S**26** and the processing is advanced to step S**31**.

A case where the processing proceeds to step S**27** is a case where a plurality of candidate devices is present. In step S**27**, a candidate selection screen for selecting one of the plurality of candidate devices is displayed on the display **161** and the processing is advanced to step S**28**. A position where the candidate selection screen is displayed is in the vicinity of the position detected by the touch panel **165** in step S**01** in FIG. **8**. In step S**28**, a standby state is kept until one of the plurality of candidate devices is selected (NO in step S**28**). If one candidate device is selected (YES in step S**28**), the processing is advanced to step S**29**. In step S**29**, all of one or more candidate devices not selected from among the plurality of candidate devices are registered as the exclusion devices and the processing is advanced to step S**30**.

In step S**30**, when the processing has proceeded from step S**29**, the candidate device selected in step S**28** is set as the cooperating device and the processing is advanced to step S**31**. In step S**31**, the short-range communicator **119** is controlled to establish a communication path with the can-

didate device set as the cooperating device in step S30 and the processing is advanced to step S32.

In step S32, the position detected by the touch panel 165 in step S21 is associated with the device set as the cooperating device in step S30 and the processing is returned to the cooperative processing. Specifically, the device identification information on the cooperating device and the position information indicating the position detected by the touch panel 165 are associated with each other and stored to the RAM 114.

Returning to FIG. 8, after the device detection processing is executed in step S01, it is judged in step S02 whether the cooperating device has been set. The processing is advanced to step S03 if the cooperating device has been set by the device detection processing. Otherwise, the processing is advanced to step S05.

In step S03, the action mode is switched to the cooperation mode and the processing is advanced to step S04. In step S04, the processing selection screen is displayed on the display 161 and the processing is advanced to step S08. The processing selection screen is a screen for selecting the device-side processing from a plurality of items of the processing executable by the MFP 100. The processing selection screen is displayed in the vicinity of the position detected by the touch panel 165 in step S01.

Hereinafter, description will be made using as an example a case where the smartphone 200A is set as the cooperating device by the device detection processing executed in step S01 when the user A places the smartphone 200A on the display surface of the display 161. In this case, the device identification information on the smartphone 200A and position identification information indicating a position on the display surface of the display 161 where the smartphone 200A is placed are temporarily stored to the RAM 114.

In step S05, it is judged whether a user's instruction has been set by the device detection processing executed in step S01. The processing is advanced to step S06 if the user's instruction has been set. Otherwise, the processing is advanced to step S08.

A case where the processing proceeds to step S06 is a case where the user gives an instruction to the touch panel 165 with a finger. In step S06, the user who has given an instruction to the touch panel 165 is specified. When the cooperating device is set in step S01, since the device identification information and the position information on the cooperating device are stored in the RAM 114, the user is specified using the above device identification information and position information on the cooperating device. For example, when the smartphone 200A is registered as the cooperating device, a section within a predetermined range from a position on the display surface of the display 161 where the smartphone 200A is placed is settled as a work area of the user A who carries the smartphone 200A. When the position detected on the touch panel 165 is included in the work area of the user A, the user who has given an instruction to the touch panel 165 is specified as the user A.

In next step S07, acceptance control processing is executed and the processing is advanced to step S08. Although the details of the acceptance control processing will be described later, the acceptance control processing is processing of settling an operation by the user A based on the position detected by the touch panel 165 and executing processing defined by the settled operation.

In step S08, it is judged whether the action mode is the cooperation mode. The processing is advanced to step S09 if the action mode is the cooperation mode. Otherwise, the processing is returned to step S01. In step S09, it is detected whether the cooperating device has left the display surface of the display 161. Since the smartphone 200A is registered as the cooperating device, the device identification information and the position information on the smartphone 200A are stored in the RAM 114. When the touch panel 165 no longer detects the contact of an object at the position specified by the position information associated with the smartphone 200A, it is judged that the smartphone 200A has left the display surface of the display 161. The processing is advanced to step S10 if it is detected that the smartphone 200A serving as the cooperating device has left the display surface of the display 161. Otherwise, the processing is advanced to step S13.

In step S10, the related image is displayed at the position on the display surface of the display 161 specified by the position information associated with the smartphone 200A and the processing is advanced to step S11. The related image is device identification information for identifying the smartphone 200A serving as the cooperating device. Alternatively, the related image may be a virtual image imitating the appearance of the smartphone 200A serving as the cooperating device. Additionally, when an image of the setting screen displayed on the smartphone 200A at that time point is acquired from the smartphone 200A serving as the cooperating device, the acquired image of the setting screen may be used as the related image.

In step S11, the portable candidate value is acquired and the processing is advanced to step S12. The short-range communicator 119 is controlled to acquire the portable candidate value from the smartphone 200A serving as the cooperating device. The portable candidate value is processing identification information for identifying processing selectable on the setting screen displayed by the smartphone or a setting value selectable on the setting screen.

In next step S12, the portable candidate value acquired in step S11 is displayed on the display 161 and the processing is returned to step S01. The portable candidate value is displayed at a position defined in advance on the basis of the position on the display surface of the display 161 specified by the position information associated with the smartphone 200A. The related image is already displayed in step S10 at the position on the display surface of the display 161 specified by the position information associated with the smartphone 200A. The portable candidate value may be superimposed on the related image when displayed or, in a case where the related image includes alphanumeric characters, may be displayed around the related image so as not to overlap with the related image. When there is a plurality of portable candidate values, all of the plurality of portable candidate values are displayed at a time. Note that, when there is no space for displaying all of the plurality of portable candidate values at a time, the plurality of portable candidate values may be displayed in a scrollable state.

In step S13, it is judged whether the short-range communicator 119 has received the application identification information from the smartphone 200A serving as the cooperating device. The processing is advanced to step S14 if the application identification information has been received. Otherwise, the processing is advanced to step S15. In step S14, an image of the application identification information is displayed as a related image at a position defined in advance on the basis of the position on the display surface of the display 161 specified by the position information associated with the smartphone 200A and the processing is returned to step S01. Since a related image different from the image of the application identification information is already displayed in step S10, the image of the application identi-

fication information is displayed around the related image displayed in step S10 so as not to overlap with the related image.

In step S15, it is judged whether the short-range communicator 119 has received the cooperation end instruction from the smartphone 200A serving as the cooperating device. The processing is advanced to step S16 if the cooperation end instruction has been received. Otherwise, the processing is advanced to step S18. In step S16, the action mode is switched to the independent mode and the processing is advanced to step S17. In step S17, the screen displayed on the display 161 is reset and the processing is returned to step S01. Specifically, the display of the processing selection screen displayed in step S04, the related image displayed in step S10, the portable candidate value displayed in step S12, and the application identification information displayed in step S14 is ended.

In step S18, it is judged whether the communication path established with the smartphone 200A serving as the cooperating device has been disconnected. When the short-range communicator 119 no longer receives a response from the smartphone 200A, it is judged that the communication path has been disconnected. The processing is advanced to step S19 if it is judged that the communication path has been disconnected. Otherwise, the processing is returned to step S01. In step S19, a message is displayed. For example, a message requesting the establishment of a communication path is displayed at a position defined in advance on the basis of the position on the display surface of the display 161 specified by the position information associated with the smartphone 200A. Specifically, the message is displayed around the position specified by the position information associated with the smartphone 200A in a region not overlapping with the already displayed image. The message is, for example, a message requesting the user to establish a communication path.

FIG. 10 is a flowchart illustrating an example of a flow of the acceptance control processing according to one or more embodiments. The acceptance control processing is processing executed in step S07 in FIG. 8. The position instructed by the user A is detected by the touch panel 165 at the stage before the acceptance control processing is executed. Referring to FIG. 10, the CPU 111 branches the processing depending on the action mode (step S51). The processing is advanced to step S52 if the action mode is the cooperation mode. The processing is advanced to step S75 if the action mode is the independent mode. In step S75, an operation defined in the independent mode is specified based on the position detected by the touch panel 165 and processing is executed in accordance with the specified operation. Then, the processing is returned to the cooperative processing.

In step S52, an operation is settled based on the position detected by the touch panel 165. Based on the position detected by the touch panel 165 while the processing selection screen, the setting value selection screen, or an image of the portable candidate value is displayed on the display 161, a position within the processing selection screen, the setting value selection screen, or the image of the portable candidate value is specified and an operation is settled. The processing selection screen includes a plurality of buttons to which a plurality of items of processing executable by the MFP 100 are individually allocated and a button to which an operation instructing the execution of the cooperative processing is allocated. When the position detected by the touch panel 165 is located within a button to which processing is allocated, an operation of selecting the processing allocated to this button is settled. When the position detected by the touch panel 165 is located within a button to which the operation instructing the execution of the cooperative processing is allocated, the operation instructing the execution of the cooperative processing is settled.

The setting value selection screen includes a plurality of buttons to which setting values are allocated. When the position detected by the touch panel 165 is located within a button to which a setting value is allocated, an operation of selecting the setting value allocated to this button is settled. Note that, when the setting value selection screen includes a keyboard containing a plurality of keys and the position detected by the touch panel 165 is located within a key, an operation of selecting an alphanumeric character allocated to this key as a portable setting value may be settled.

In addition, when the position detected by the touch panel 165 is located within one of one or more portable setting values, an operation instructing the portable setting value including the position detected by the touch panel 165 is settled.

In step S53, it is judged whether the operation settled in step S52 is an operation of selecting processing. The processing is advanced to step S54 if the operation of selecting processing has been settled. Otherwise, the processing is advanced to step S56. In step S54, the selected processing is set as the device-side processing and the processing is advanced to step S55. In step S55, a setting value setting screen for setting a setting value used for executing the device-side processing is displayed on the display 161 and the processing is advanced to step S58.

In step S56, it is judged whether the operation settled in step S52 is an operation of selecting a setting value. The processing is advanced to step S57 if the operation of selecting a setting value has been settled. Otherwise, the processing is advanced to step S64. A case where the processing proceeds to step S57 is a case where the position detected by the touch panel 165 is located within a button to which a setting value included in the setting value selection screen displayed in step S55 is allocated. In this case, an operation of selecting a setting value allocated to that button is settled. In step S57, the selected setting value is set as the device setting value and the processing is advanced to step S58.

In step S58, it is judged whether a drag operation has been detected. When the touch panel 165 continues to detect the same position for a predetermined time or longer, a drag operation is detected. When the processing has proceeded from step S55, the drag operation is detected in a case where a position within a button allocated to the device-side processing on the processing selection screen is continuously detected by the touch panel 165 for a predetermined time or longer. When the processing has proceeded from step S57, the drag operation is detected in a case where a position within a button allocated to the device setting value on the setting value selection screen is continuously detected by the touch panel 165 for a predetermined time or longer. The processing is advanced to step S59 if a drag operation has been detected. Otherwise, the processing is returned to the cooperative processing.

In step S59, it is judged whether a drop operation has been detected. A drop operation is detected when the last detected position is different from a position where the drag operation was detected at a time point when a position instructed by the finger is no longer detected by the touch panel 165 after the drag operation is detected. The position last detected by the touch panel 165 is specified by the drop operation and an operation is settled based on the specified position. The

processing is advanced to step S60 if a drop operation has been detected. Otherwise, the processing is returned to the cooperative processing.

In step S60, it is judged whether an operation of selecting the portable candidate value has been settled by the drop operation. If the position specified by the drop operation is located within one of images of one or more portable candidate values, an operation of selecting the corresponding portable candidate value is specified. The processing is advanced to step S61 if an operation of selecting the portable candidate value has been settled by the drop operation. Otherwise, the processing is advanced to step S63. In step S61, it is judged whether the cooperative processing can be specified. Whether the cooperative processing can be executed is judged depending on the device-side processing set in step S54 and the device setting value set in step S57 and the portable candidate value selected in step S60. When a combination of the device-side processing, the device setting value, and the portable candidate value is not prohibited in advance, it is judged that the cooperative processing can be specified. The processing is advanced to step S62 if the cooperative processing can be specified. Otherwise, the processing is advanced to step S63. In step S62, the short-range communicator **119** is controlled to transmit the setting instruction to the smartphone **200**A serving as the cooperating device and the processing is returned to the cooperative processing. The setting instruction is a command instructing the setting of the portable candidate value set in step S60 and includes the portable candidate value set in step S60. In step S63, an error message is displayed on the display **161** and the processing is returned to the cooperative processing. The error message is a message notifying that the drag operation and the drop operation are inappropriate.

In step S64, it is judged whether the operation settled in step S52 is an operation instructing the portable candidate value. The processing is advanced to step S65 if the operation instructing the portable candidate value has been settled. Otherwise, the processing is advanced to step S72. In step S65, the short-range communicator **119** is controlled to transmit the setting instruction to the smartphone **200**A serving as the cooperating device and the processing is advanced to step S66. The setting instruction includes the portable candidate value specified by the operation settled in step S52.

In step S66, it is judged whether a drag operation has been detected. Here, when the touch panel **165** continues to detect a position within an image of the portable candidate value for a predetermined time or longer, a drag operation is detected. The processing is advanced to step S67 if a drag operation has been detected. Otherwise, the processing is returned to the cooperative processing.

In step S67, it is judged whether a drop operation has been detected. The processing is advanced to step S68 if a drop operation has been detected. Otherwise, the processing is returned to the cooperative processing. In step S68, it is judged whether an operation of selecting processing or an operation of selecting a setting value has been settled by the drop operation. The processing is advanced to step S69 if an operation of selecting processing or an operation of selecting a setting value has been settled by a drop operation. Otherwise, the processing is advanced to step S71. In step S68, it is judged whether the cooperative processing can be specified. Whether the cooperative processing can be executed is judged depending on the portable candidate value included in the setting instruction transmitted in step S66 and the processing or the setting value selected by the drop operation. When a combination of the portable candidate value and the processing or the setting value selected by the drop operation is not prohibited in advance, it is judged that the cooperative processing can be specified. The processing is advanced to step S70 if the cooperative processing can be specified. Otherwise, the processing is advanced to step S71. In step S70, the processing or the setting value selected by the drop operation is set and the processing is returned to the cooperative processing. Specifically, when processing is selected by the drop operation, the selected processing is set as the device-side processing and, when a setting value is selected by the drop operation, the selected setting value is set as the device setting value. In step S71, an error message is displayed on the display **161** and the processing is returned to the cooperative processing. The error message is a message notifying that the drag operation and the drop operation are inappropriate.

In step S72, it is judged whether the operation settled in step S52 is an execution instruction operation instructing the execution of the cooperative processing. The processing is advanced to step S73 if the operation is an execution instruction operation. Otherwise, the processing is returned to the cooperative processing. In step S73, the short-range communicator **119** is controlled to transmit the execution instruction to the smartphone **200**A serving as the cooperating device and the processing is advanced to step S74. In step S74, the device-side processing is executed in cooperation with the smartphone **200**A serving as the cooperating device in accordance with the device-side setting value and the processing is returned to the cooperative processing.

Note that, when the cooperative processing specified in step S61 or the cooperative processing specified in step S69 can be executed, the processing may be advanced to step S73 such that the cooperative processing is executed immediately after the drop operation.

FIG. **11** is a flowchart illustrating an example of a flow of portable-side cooperative processing according to one or more embodiments. The portable-side cooperative processing is processing executed by the CPU **201** included in the smartphone **200**A when the CPU **201** executes the portable-side cooperative programs stored in the flash memory **203** and the CD-ROM **211**A. Referring to FIG. **11**, it is judged whether the short-range communicator **209** has received a search command. The processing is advanced to step S202 if the search command has been received. Otherwise, the processing is advanced to step S205. A case where the search command transmitted by the MFP **100** is received will be described here as an example.

In step S202, the short-range communicator **209** is controlled to return a response command. Then, it is judged whether the short-range communicator **209** has received a connection request from the MFP **100** that has transmitted the search command received in step S201 (step S203). The processing is advanced to step S204 if the connection request has been received. Otherwise, the processing is advanced to step S205. In step S204, a communication path is established with the MFP **100** that has transmitted the connection request and the processing is advanced to step S205.

In step S205, the setting screen is displayed on the display **206** and the processing is advanced to step S206. In step S206, it is judged whether an operation has been accepted. A position on the setting screen is specified based on the position detected by the touch panel **207**B and an operation is settled. When the operation is settled, it is judged that the operation has been accepted. The processing is advanced to step S207 if the operation has been accepted. Otherwise, the processing is advanced to step S217. When the setting

screen includes a button to which an operation is allocated and a position in this button is specified, the operation allocated to the button is settled. For example, when the setting screen includes a plurality of processing selection buttons to which a plurality of items of processing is individually allocated and a position in one of the plurality of processing selection buttons is specified, a processing selection operation of selecting processing allocated to this processing selection button is settled. When the setting screen includes a plurality of setting value selection buttons to which a plurality of setting values is individually allocated and a position in one of the plurality of setting value selection buttons is specified, a setting value selection operation of selecting a setting value allocated to this setting value selection button is settled. In addition, in a case where the setting screen includes a keyboard containing a plurality of keys, when a position in one of the plurality of keys is specified, an operation of inputting an alphanumeric character allocated to this key as a setting value is settled. Furthermore, when the operation screen includes a cooperation end key to which a cooperation end operation instructing the end of the cooperative processing is allocated and a position in the cooperation end key is specified, the cooperation end operation is settled. When the operation screen includes a screen switching key for switching to another operation screen and a position in the screen switching key is specified, a screen switching operation is settled.

Meanwhile, there is a case where, when an application task that executes an application program different from the cooperative program is activated, a task switching key to which an operation of switching a task to this application task is allocated is displayed on the operation screen. Examples thereof include a case where an application task that executes an application program for calling is activated in response to an incoming call and a case where an application task that executes an application program for transmitting and receiving e-mails is activated in response to the reception of an e-mail. When a position in the task switching key is specified, a task switching operation is settled.

In step **S207**, it is judged whether the operation accepted in step **S206** is the task switching operation. The processing is advanced to step **S208** if the task switching operation has been accepted. Otherwise, the processing is advanced to step **S210**. In step **S208**, a task specified by the task switching key is switched to the current state and the processing is advanced to step **S209**.

In step **S209**, the short-range communicator **209** is controlled to transmit the application identification information on an application program corresponding to the task in the current state to the MFP **100** and the processing is advanced to step **S210**.

In step **S210**, it is judged whether the cooperative task is in the current state. The processing is advanced to step **S211** if the cooperative task is in the current state. Otherwise, the processing is advanced to step **S216**. In step **S216**, processing defined by the application task in the current state is executed and the processing is returned to step **S206**.

In step **S211**, the processing is branched depending on the operation accepted in step **S206**. If the screen switching operation has been accepted, the processing is advanced to step **S212**. If the processing selection operation has been accepted, the processing is advanced to step **S213**. If the setting value selection operation has been accepted, the processing is advanced to step **S214**. If the cooperation end operation has been accepted, the processing is advanced to step **S215**.

In step **S212**, the screen displayed on the display **206** is switched to the setting screen specified by the screen switching operation and the processing is returned to step **S206**. In step **S213**, the processing selected by the processing selection operation is set as the portable-side processing and the processing is returned to step **S206**. In step **S214**, the setting value selected by the setting value selection operation is set as the portable setting value and the processing is returned to step **S206**. In step **S215**, the short-range communicator **209** is controlled to transmit the cooperation end instruction to the MFP **100** and the processing is returned to step **S206**.

In step **S217**, it is judged whether the portable candidate value has been requested by the MFP **100**. Specifically, when the short-range communicator **209** receives a signal requesting the transmission of the portable candidate value from the MFP **100**, it is judged that the portable candidate value has been requested. The processing is advanced to step **S218** if the portable candidate value has been requested. Otherwise, the processing is advanced to step **S219**. In step **S218**, the portable candidate value is transmitted and the processing is returned to step **S206**. The portable candidate value includes the processing identification information on each of one or more items of processing selectable on the setting screen displayed on the display **206** at a time point when the portable candidate value is requested and one or more setting values selectable on this setting screen.

In step **S219**, it is judged whether the setting instruction has been received from the MFP **100**. The processing is advanced to step **S220** if the setting instruction has been received. Otherwise, the processing is advanced to step **S221**. In step **S220**, the portable candidate value included in the setting instruction is set and the processing is returned to step **S206**. When the portable candidate value is the processing identification information, processing identified by the processing identification information is set as the portable-side processing and, when the portable candidate value is the setting value, the setting value is set as the portable setting value.

In step **S221**, it is judged whether the short-range communicator **209** has received the execution instruction from the MFP **100**. The processing is advanced to step **S222** if the execution instruction has been received. Otherwise, the processing is returned to step **S206**. In step **S222**, the portable-side processing is executed in cooperation with the MFP **100** in accordance with the portable setting value and the processing is returned to step **S206**.

<First Modification>

When the short-range communicator **119** communicates using an NFC communication technique, the user A may bring the smartphone **200**A close to an antenna of the short-range communicator **119** before placing the smartphone **200**A on the display surface of the display **161**. In this case, the device detector **15** controls the short-range communicator **119** and the touch panel **165** such that, after the short-range communicator **119** detects the smartphone **200**A and establishes the communication path, the touch panel **165** is caused to detect the position where the smartphone **200**A is placed within a predetermined time.

FIG. **12** is a flowchart illustrating an example of a flow of device detection processing according to the first modification. The device detection processing of the first modification is executed in step **S01** of the cooperative processing illustrated in FIG. **8**. Referring to FIG. **12**, a CPU **111** judges whether a short-range communicator **119** that communicates according to an NFC standard has detected a device (step

S81). The processing is advanced to step S82 if a device has been detected. Otherwise, the processing is advanced to step S84.

In step S82, the device detected by the short-range communicator 119 is specified and the processing is advanced to step S83. The device is specified by receiving the device identification information from the device. A case where a smartphone 200A is detected will be described here as an example.

In step S83, a communication I/F 112 is controlled to establish a communication path with the device specified in step S82, here, the smartphone 200A and the processing is advanced to step S84.

In step S84, it is judged whether an object has made contact with the display surface of a display 161. Specifically, when a touch panel 165 is controlled and the touch panel 165 detects a position with which the object has made contact, it is judged that the object has made contact with the display surface of the display 161. The processing is advanced to step S85 if the touch panel 165 has detected a position with which the object has made contact. Otherwise, the processing is returned to the cooperative processing.

In next step S85, it is judged whether the area of a region where the object is in contact with the display surface of the display 161 is equal to or larger than a predetermined size. The predetermined size is the upper limit of the area of the user's finger. This is for distinguishing between an instruction by a finger of a person and an instruction by the smartphone 200A being laid down. The processing is advanced to step S86 if the area of the region where the object has made contact with the display surface of the display 161 is equal to or larger than the predetermined size. Otherwise, the processing is advanced to step S89. In step S89, the user's instruction is set and the processing is returned to the cooperative processing.

In step S86, it is judged whether it is within a predetermined time after the detection of the smartphone 200A in step S81. The processing is advanced to step S87 if it is within the predetermined time after the detection of the smartphone 200A. Otherwise, the processing is returned to the cooperative processing. In step S87, the smartphone 200A, which is the device specified in step S82, is set as the cooperating device and the processing is advanced to step S88. In step S88, the position detected by the touch panel 165 in step S84 is associated with the cooperating device and the processing is returned to the cooperative processing.

<Second Modification>

In the first modification, the device detector 15 causes the short-range communicator 119 that can communicate using the communication technique based on the NFC standard to detect the smartphone 200A. In a second modification, a smartphone 200A receives a radio wave from a GPS satellite to measure the current position of the smartphone 200A. A device detector 15 of the second modification acquires the current position from the smartphone 200A and settles a relative position between the smartphone 200A and an MFP 100 from the acquired current position of the smartphone 200A and a position where the MFP 100 is arranged. In this case, the smartphone 200A is detected in step S81 illustrated in FIG. 12 when the smartphone 200A is present within a predetermined range from the MFP 100.

<Third Modification>

The device detector 15 may detect the smartphone 200A using human body communication that communicates using a human body as a medium. Specifically, when communication with an integrated circuit (IC) tag capable of the human body communication owned by a user A is enabled, a device detector 15 of the third modification detects a smartphone 200A carried by the user A. In this case, the smartphone 200A carried by the user A is detected in step S81 illustrated in FIG. 12 when communication with the integrated circuit (IC) tag capable of the human body communication owned by the user A is enabled.

<Fourth Modification>

The smartphone 200A may be detected using the position of the user A managed in an entry/exit management system that manages entry and exit of the user. In this case, an MFP 100 is installed in a work room managed by the entry/exit management system and each of a plurality of users carries a unique IC tag.

The entry/exit management system has a memory storing user identification information for identifying the owner of the IC tag and a tag reader for reading the IC tag. When the user enters the work room, the user brings his/her IC tag into proximity to or in contact with the tag reader of the entry/exit management system. The tag reader detects the entry of the user by reading the IC tag that is brought into proximity or in contact and specifies the user identification information for identifying the owner of the IC tag. In addition, when the user exits the work room, the user brings his/her IC tag into proximity to or in contact with the tag reader of the entry/exit management system. The tag reader detects the exit of the user by reading the IC tag that is brought into proximity or in contact.

A device detector 15 of the fourth modification acquires, from the entry/exit management system, the position of the work room and the user identification information on the user who has entered this work room. The device detector 15 of the fourth modification acquires, from the entry/exit management system, the position of the work room and the user identification information on the user who has exited this work room. When the user who has entered the work room where the MFP 100 is arranged is specified based on a pair of the user's position and the user identification information acquired from the entry/exit management system, the device detector 15 of the fourth modification detects a smartphone carried by the specified user. For example, when the MFP 100 is arranged in a work room A, the smartphone 200A carried by the user A is detected in response to the acquisition of the position of the work room A and the user identification information on the user A from the entry/exit management system. Since the user identification information for identifying the owner of the IC tag used in the entry/exit management system is used, the user can be identified. In this case, the smartphone 200A carried by the user A is detected in step S81 illustrated in FIG. 12 in response to the acquisition of the position of the work room A and the user identification information on the user A from the entry/exit management system.

<Fifth Modification>

The MFP 100 may be provided with a function of image authentication for the user A present in the surroundings of the MFP 100 so as to detect the smartphone 200A using an authentication result. The MFP 100 includes a camera whose angle of view includes the periphery of the MFP 100 and authenticates the user A based on an image output by the camera after imaging the user A as a subject at a time point when the user A enters the angle of view of the camera. A device detector 15 of the fifth modification detects a smartphone 200A carried by a user A when the authentication of the user A is successful. In this case, the smartphone 200A carried by the user A is detected in step S81 illustrated in FIG. 12 based on an image captured by the camera when the authentication of the user A is successful.

<Sixth Modification>

The MFP **100** may detect the position of a user present in the surroundings of the MFP **100** and detect a device for which communication by the short-range communicator **119** is enabled. The MFP **100** includes a human sensor and the MFP **100** detects the position of a user present in the surroundings. The human sensor is, for example, an infrared sensor or a pyroelectric sensor. In addition, the human sensor may detect a person by extracting an image of the person from an image captured by a camera.

After a person is detected by the human sensor, a device detector **15** detects a device for which communication by a short-range communicator **119** is enabled. For example, when a user A approaches the MFP **100**, the user A is detected by the human sensor. After a person is detected by the human sensor, the device detector **15** detects a smartphone **200**A for which communication by the short-range communicator **119** is enabled. In this case, the smartphone **200**A for which communication by the short-range communicator **119** is enabled is detected in step S**81** illustrated in FIG. **12** after a person is detected by the human sensor.

<Seventh Modification>

In one or more embodiments, the MFP **100** displays the portable candidate value acquired from the smartphone **200**A and causes the smartphone **200**A to set the portable candidate value selected by the user. In a seventh modification, the remote operator **27** included in the MFP **100** and the remote controller **257** included in the smartphone **200**A are modified.

A remote operator **27** of the seventh modification acquires the portable-side setting screen from the smartphone **200**A and displays the portable-side setting screen on a display **161**. Then, in response to the user A instructing a position on the portable-side setting screen, the position information indicating the position instructed on the portable-side setting screen is transmitted to the smartphone **200**A. Meanwhile, a remote controller **257** of the seventh modification transmits the portable-side setting screen displayed on a display **206** to the MFP **100** and, in response to the reception of the position information from the MFP **100**, specifies an operation from the position on the portable-side setting screen specified by the position information. As a result, since the MFP **100** can remotely operate the smartphone **200**A, it is possible to set two devices, namely, the MFP **100** and the smartphone **200**A, on the display surface of the display **161**.

As described above, the MFP **100** functioning as the information processing device executes the cooperative processing in cooperation with the smartphone **200**A functioning as the portable device. The MFP **100** detects the smartphone **200**A in response to the touch panel **165** detecting a position with which an object has made contact and establishes a communication path with the smartphone **200**A. Then, when the communication path is established with the smartphone **200**A and the touch panel **165** detects the contact of the smartphone **200**A, the mode is switched to the cooperation mode and, in response to the touch panel **165** no longer detecting the contact of the smartphone **200**A in the cooperation mode, the related image relating to the smartphone **200**A is displayed. Therefore, when the smartphone **200**A leaves the display surface of the display **161**, it is possible to notify the user that the cooperation mode is running.

In addition, since a virtual image imitating the appearance of the smartphone **200**A is displayed as the related image, it is possible to notify by image that the cooperating device is the smartphone **200**A.

In addition, since the device identification information for identifying the smartphone **200**A is displayed as the related image, it is possible to specify the smartphone **200**A and notify that the smartphone **200**A is cooperating.

Furthermore, since the image of the portable-side setting screen displayed on the smartphone **200**A is displayed as the related image, it is possible to notify the state of the smartphone **200**A.

Additionally, since one or more portable-side candidate values, each of which is a candidate for the portable-side setting value that can be settled while the smartphone **200**A is displaying the portable-side setting screen, are displayed on the display **161**, a value settable between the smartphone **200**A and the MFP **100** can be displayed on one screen.

Furthermore, since the MFP **100** transmits, to the smartphone **200**A, a direction to set selected one or more portable-side candidate values in response to the selection of one or more of the displayed one or more portable-side candidate values, the one or more portable-side candidate values can be set in the smartphone **200**A as the portable setting values.

In addition, since the MFP **100** enables the setting of the smartphone **200**A and the setting of the MFP **100** by the drag-and-drop operation, two setting values can be set by one operation from the contact of a finger with the display surface of the display **161** until the release of the finger, whereby the operation is facilitated.

Meanwhile, when a predetermined application program is executed in the smartphone **200**A, since the application identification information thereon is displayed on the display **161**, the application program to be executed in the smartphone **200**A can be notified.

Furthermore, when a communication path established with the smartphone **200**A is disconnected, since a message for restoring the communication path is displayed, it is possible to notify the user that the communication path has been disconnected.

In addition, since the cooperation end instruction is transmitted from the smartphone **200**A to the MFP **100** once the user inputs the cooperation end instruction to the smartphone **200**A, the action mode of the MFP **100** can be switched to the independent mode by operating the smartphone **200**A. Therefore, the user A can switch the action mode of the MFP **100** from a position away from the MFP **100**.

APPENDIX

(1) The cooperative system according to Item. 2, wherein

the information processing device further includes the hardware processor that:

acquires one or more portable-side candidate values, each of which is a candidate for a portable-side setting value settleable by the portable device while the portable-side setting screen is being displayed;

displays the acquired one or more portable-side candidate values on the display; and

transmits, in response to selection of one or more of the one or more portable-side candidate values displayed on the display by an operation accepted by the device-side acceptor, a direction to set the selected one or more portable-side candidate values to the portable device, and

the portable device further includes the hardware processor that causes, in response to reception of the direction to set the selected one or more portable candidate values from the information processing device, the hardware processor to set the selected one or more

portable-side candidate values as the portable-side setting values. According to one or more embodiments, the portable setting value can be set in the portable device by operating the information processing device.

Although embodiments of the present invention have been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and not limitation, the scope of the present invention should be interpreted by terms of the appended claims. It is intended that all modifications within the meaning and scope of the claims and the equivalents thereof are included.

What is claimed is:

1. A cooperative system comprising an information processing device and a portable device carried by a user, wherein

the information processing device includes:

a display that displays an image;

a position detector that detects a position on a display surface of the display with which an object has made contact; and

a hardware processor that:

detects the portable device in response to the position detector detecting that the portable device is placed on the display surface;

establishes a communication path with the portable device;

switches an independent mode not cooperating with the portable device to a cooperation mode cooperating with the portable device when a communication path with the portable device is established and the portable device is detected by the hardware processor; and

displays a related image that is related to the portable device on the display in response to the hardware processor detecting that the portable device is removed from the display surface and the communication path is still established.

2. The cooperative system according to claim **1**, wherein the portable device includes

a hardware processor that:

accepts an operation input by a user;

displays a portable-side setting screen for settling a portable-side setting value used for executing portable-side processing defined as processing to be executed by the portable device among processing in the cooperation mode;

sets the portable-side setting value settled based on an operation accepted by the hardware processor; and

executes the portable-side processing in cooperation with the information processing device based on the set portable-side setting value, and

the information processing device further includes the hardware processor that:

accepts an operation input by a user in response to the position detector detecting a position with which an object has made contact;

displays, on the display, a device-side setting screen for settling one or more device-side setting values used for executing device-side processing defined as processing to be executed by the information processing device among processing in the cooperation mode;

sets the device-side setting value settled based on an operation accepted by the hardware processor; and

executes the device-side processing in cooperation with the portable device based on the set device-side setting value.

3. The cooperative system according to claim **2**, wherein the information processing device further includes the hardware processor that:

acquires one or more portable-side candidate values, each of which is a candidate for a portable-side setting value settleable by the portable device while the portable-side setting screen is being displayed;

displays the acquired one or more portable-side candidate values on the display; and

transmits, in response to selection of one or more of the one or more portable-side candidate values displayed on the display by an operation accepted by the hardware processor, a direction to set the selected one or more portable-side candidate values to the portable device, and

the portable device further includes the hardware processor that causes, in response to reception of the direction to set the selected one or more portable candidate values from the information processing device, the hardware processor to set the selected one or more portable-side candidate values as the portable-side setting values.

4. An information processing device that executes cooperative processing in cooperation with a portable device carried by a user, the information processing device comprising:

a display that displays an image;

a position detector that detects a position on a display surface of the display with which an object has made contact;

a hardware processor that:

detects the portable device in response to the position detector detecting that the portable device is placed on the display surface;

establishes a communication path with the portable device;

switches an independent mode not cooperating with the portable device to a cooperation mode cooperating with the portable device when the communication path with the portable device is established and the portable device is detected by the hardware processor; and

displays a related image that is related to the portable device on the display in response to the hardware processor detecting that the portable device is removed from the display surface and the communication path is still established.

5. The information processing device according to claim **4**, wherein the related image includes a virtual image that imitates an appearance of the portable device.

6. The information processing device according to claim **4**, wherein the related image includes device identification information that identifies the portable device.

7. The information processing device according to claim **4**, wherein the hardware processor further acquires, from the portable device, image information on a portable-side setting screen displayed on the portable device to display on the display.

8. The information processing device according to claim **4**, wherein the hardware processor further:

acquires one or more portable-side candidate values, each of which is a candidate for a portable-side setting value settleable by the portable device while the portable device displays a portable-side setting screen; and

displays the acquired one or more portable-side candidate values on the display.

9. The information processing device according to claim 8, wherein the hardware processor further:

accepts an operation input by a user in response to the position detector detecting a position with which an object has made contact; and

transmits, in response to selection of one or more of one or more portable-side candidate values displayed on the display by an operation accepted by the hardware processor, a direction to set the selected one or more portable-side candidate values to the portable device.

10. The information processing device according to claim 9, wherein the hardware processor further:

displays, on the display, a device-side setting screen for settling one or more device-side setting values used for executing device-side processing defined as processing to be executed by the information processing device among processing in the cooperation mode;

sets the device-side setting value settled based on an operation accepted by the hardware processor;

executes the device-side processing in cooperation with the portable device based on the set device-side setting value; and

accepts an operation of selecting one of any one of the one or more portable-side setting values displayed on the display and any one of the one or more device-side setting values selectable on the device-side setting screen, while the other is being selected.

11. The information processing device according to claim 4, wherein the hardware processor further:

accepts an operation input by a user in response to the position detector detecting a position with which an object has made contact;

displays, on the display, a device-side setting screen for settling one or more device-side setting values that executes device-side processing defined as processing to be executed by the information processing device among the cooperative processing;

sets the device-side setting value settled based on an operation accepted by the hardware processor;

executes the device-side processing in cooperation with the portable device based on the set device-side setting value;

acquires screen information regarding a portable-side setting screen displayed by the portable device from the portable device and displays a remote operation screen on the display based on the screen information; and

transmits a remote operation defined by the screen information to the portable device when the operation accepted by the hardware processor is an operation on the displayed remote operation screen.

12. The information processing device according to claim 4, wherein the hardware processor further displays, when a predetermined application program is executed in the portable device, application identification information that identifies the application program on the display.

13. The information processing device according to claim 4, wherein the hardware processor further notifies a user when a communication path established with the portable device is disconnected.

14. The information processing device according to claim 4, wherein the hardware processor switches an action mode to the independent mode in response to reception of end information that indicates the end of the cooperation mode from the portable device.

15. A cooperation method executed by an information processing device that executes cooperative processing in cooperation with a portable device carried by a user, wherein the information processing device comprises a display that displays an image and a position detector that detects a position on a display surface of the display with which an object has made contact, the cooperation method comprising:

detecting the portable device in response to the position detector detecting that the portable device is placed on the display surface;

establishing a communication path with the portable device;

switching an independent mode not cooperating with the portable device to a cooperation mode cooperating with the portable device when a communication path with the portable device is established and the portable device is detected; and

displaying a related image that is related to the portable device on the display in response to detecting that the portable device is removed from the display surface and the communication path is still established.

16. A non-transitory recording medium storing a computer readable cooperative program executed by a computer that controls an information processing device that executes cooperative processing in cooperation with a portable device carried by a user, wherein the information processing device includes a display that displays an image and a position detector that detects a position on a display surface of the display with which an object has made contact, the cooperative program causing the computer to execute:

detecting the portable device in response to the position detector detecting that the portable device is placed on the display surface;

establishing a communication path with the portable device;

switching an independent mode not cooperating with the portable device to a cooperation mode cooperating with the portable device when a communication path with the portable device is established and the portable device is detected; and

displaying a related image that is related to the portable device on the display in response to detecting that the portable device is removed from the display surface and the communication path is still established.

* * * * *